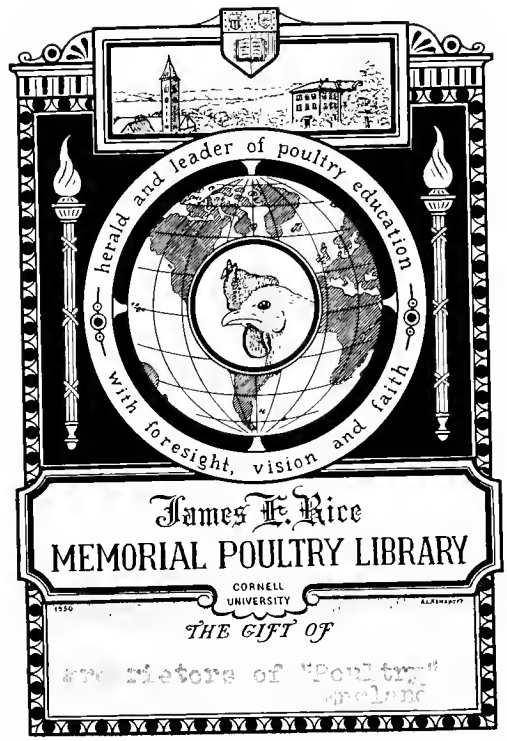
POULTRY BREEDING AND MANAGEMENT

WILLIAM W. BROOMHEAD



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POULTRY BREEDING AND MANAGEMENT

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A COMPREHENSIVE AND SYSTEMATIC GUIDE
TO ALL BRANCHES OF POULTRY CULTURE FOR THE NOVICE,
THE TABLE POULTRY SPECIALIST, THE PEDIGREE BREEDER AND FANCIER,
AND THE COMMERCIAL EGG-FARMER

BY

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PREFACE

POULTRY-KEEPING has been practised in this country for centuries; yet it is only during comparatively recent times that it has become a great productive industry. Not only is it now a very important branch of husbandry, but poultry-farming to-day is a highly skilled occupation requiring specialized knowledge. However, although it has been very considerably extended, and improved methods are being steadily evolved, there is still scope for much development, because Britain is far from being self-supporting in the matter of eggs and table poultry.

I have written this book with the object of teaching the reader how to breed and manage poultry in such a way that they shall prove a source of pleasure and profit to him, as they have always been to me. The greater part of my life has been devoted solely to the subject. I have specialized in it, and have practised it through the whole of its phases from back-garden poultry-keeping to commercial poultry-farming. And, except in the cases I have quoted —and which are from thoroughly reliable sources—I have written of my own personal experience in the breeding and management of such stock.

In addition to raising pullets for prolific egg production, I have reared and fattened table poultry, and have finished such birds as the latter by the approved Sussex method of cramming by machine. In the other section, that known as the Fancy, I have refrained from exhibiting birds for prizes, simply because I took up judging at an early age. But I have bred prize stock of many varieties and am *au fait* with every standard of the several kinds, old and new, which are shown. Consequently, never before has such full information on standard breeds been placed before the public as that contained in Chapter IX.

Poultry-keepers, whether working along large or small lines, will find in this work that which will be worth not only their perusal but their study, while it cannot fail to prove a source of valuable information to those who contemplate going in for poultry, whether as a hobby, a part-time occupation, or as their sole livelihood.

One word more. It concerns the illustrations. To the courtesy of the proprietors of *Poultry* (Messrs. O. F. Bates Ltd.) I am indebted for the loan of several photographs and sketches, and also for permission to reproduce the coloured plates, while my thanks are due to Mr. Claude Hosegood, the animal photographer, for his portrayal of the breeds.

WILLIAM W. BROOMHEAD

SOUTHRIDGE,
STREATLEY, BERKS.

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POULTRY BREEDING AND MANAGEMENT

CHAPTER I

THE PRESENT STATUS OF THE POULTRY INDUSTRY

THE poultry industry of this country is a comparatively young one. It is no exaggeration to say that it scarcely existed before 1920, because previous to the War very little progress had been made in organizing it on a business basis. As most people are probably aware, poultry-keeping has been carried on in Great Britain for hundreds of years; but while no claim is made, as some authorities do, that it reached England with the Roman Invasion or that it was firmly established here before that event had taken place, there are authentic records which show that our ancestors, who were renowned for the breeding of Game cocks for fighting, were by no means unacquainted with the domestic fowl of the farmyard.

It was not until the latter part of last century that any serious attention was paid to poultry-keeping as a commercial proposition; but even then, so very diverse and often futile were the schemes advocated that little practical headway was achieved. It took the War to draw public attention to poultry-keeping as an economic means of producing food-stuff, although, at the beginning, so insignificant did it appear to be in some quarters that those who had faith in it were told, officially, they must kill off their stocks, so that grain should not be "wasted" on them. Fortunately, however, on the advice of the few practical men who knew what such a catastrophe would mean, wiser counsels prevailed and the order was rescinded; so that to-day the poultry industry has attained a position of some importance in the affairs of the nation.

Recent Developments

During the past decade or two there has been a steady increase in the number of poultry-keepers in Great Britain; and this has been accomplished despite the depressing times through which this country has occasionally had to pass and the many obstacles there have been to surmount. Since the advent of the War something like a revolution has occurred in the methods by which poultry are managed; and this has meant that many of our old and cherished ideas have had to be abandoned to adjust our systems to present-day conditions.

All these revolutionary changes in, and, generally, improvement of, our methods are very evident to those who make it their special business to keep abreast of the times in matters pertaining to poultry. So much progress has been made that, if statistics were available, it would undoubtedly be found that, as far as husbandry is concerned, many more people now find employment with poultry than with any other class of livestock. Indeed, it is not too much to say that

FIG. 1. UP-TO-DATE POULTRY-KEEPING ON THE FARM
Field houses fitted with slatted floors and trap-nests; also, as seen on the left, outside dry mash hoppers

there are to-day half a million people in England and Wales engaged in the production of eggs and table birds, while there must be another 50,000 so occupied in Scotland.

Keeping in very close touch with poultry matters as I have done for considerably more than thirty years, this much is made evident to me, not only from personal observation but from the thousands of letters of inquiry which pass through my hands each year. It enables me to state, without the slightest fear of contradiction, that poultry husbandry is now a great national industry and one, moreover, in which all classes of the community can participate. It did not surprise me to find, therefore, that the census taken in 1936 recorded an increase of young stock kept on holdings of one acre and upwards in England and Wales, sure proof that poultry specialists have every reason to feel confident of the future. That census included the stocks kept by agriculturists and commercial egg-farmers who are working on a large scale, although, carefully as it was made, it did not include the whole of those people who were at the time engaged in poultry-farming as a means of livelihood, because in my district alone there were some such men who were not in possession of the necessary forms, a fact that unfortunately did not come to my notice until many months after the returns had been made.

Moreover, that census did not include, because it could not possibly take into account, the vast numbers of suburban and cottage poultry enthusiasts, both fanciers and utilitarians, who keep exhibition birds, a small head of breeding stock, or a flock of laying hens in garden or on allotment, and who are so important a factor in the food supply of the country. However, it is safe to say that during the past ten years egg production has increased by almost 100 per cent, while in 1936 the grand total of eggs produced was over three thousand millions. It is worth noting, also, that the estimated value of eggs and poultry actually produced during 1936 in England, Wales and Scotland—production values, and excluding the amount of money obtained from the sale of eggs for hatching and stock for breeding—was £30,000,405. This figure was greater by £3,085,405 than the total values of the cereal crops (barley, oats, and wheat) for the same period, which, it must be admitted, shows to what extent the poultry industry has grown.

FIG. 2. REARING PULLETS ON THE FARM

The flock shown above consists of Rhode Island Red and White Wyandotte pullets. Their roosting house is of the Sussex ark type, and of a kind which may be placed on a meadow, to be moved to a fresh site every week or so, while the fowls have practically unlimited range

Imports of Poultry Produce

Now, enormous as that amount is, it does no more than indicate what has been accomplished; but since we still import vast quantities of poultry produce, it must be obvious to the most casual observer that there is room for great expansion of home activities. Without going too minutely into figures, it may be stated that the Trade and Navigation Returns for 1936 show that this country was still being flooded with foreign eggs and poultry, since the imports of eggs in shell in

that year reached the tremendous total of 24,653,222 great hundreds (exceeding 2,958,386,600 eggs), while there were also 889,997 cwt. of "eggs not in shell" imported, and poultry (dead) to the value of about £1,656,900.

It is as well to mention that the output required to replace imported produce does not by any means represent the full extent to which we can increase home supplies without saturating our markets. Although there are no foods more nourishing than eggs and poultry meat, the average number of eggs and fowls eaten in this country *per capita* of population is very small indeed; hence the possibilities of increasing the consumption of poultry products are tremendous. There is plenty of room for those who wish to go in for poultry-keeping; because, even if the present quantities of home produce were doubled, it would probably not overtake the demand. At any rate, I am fully convinced that there is not the remotest danger of over-production of home egg supplies or table poultry; and I do not think that anyone in possession of the full facts could find the slightest reason to fear over-production for many years to come.

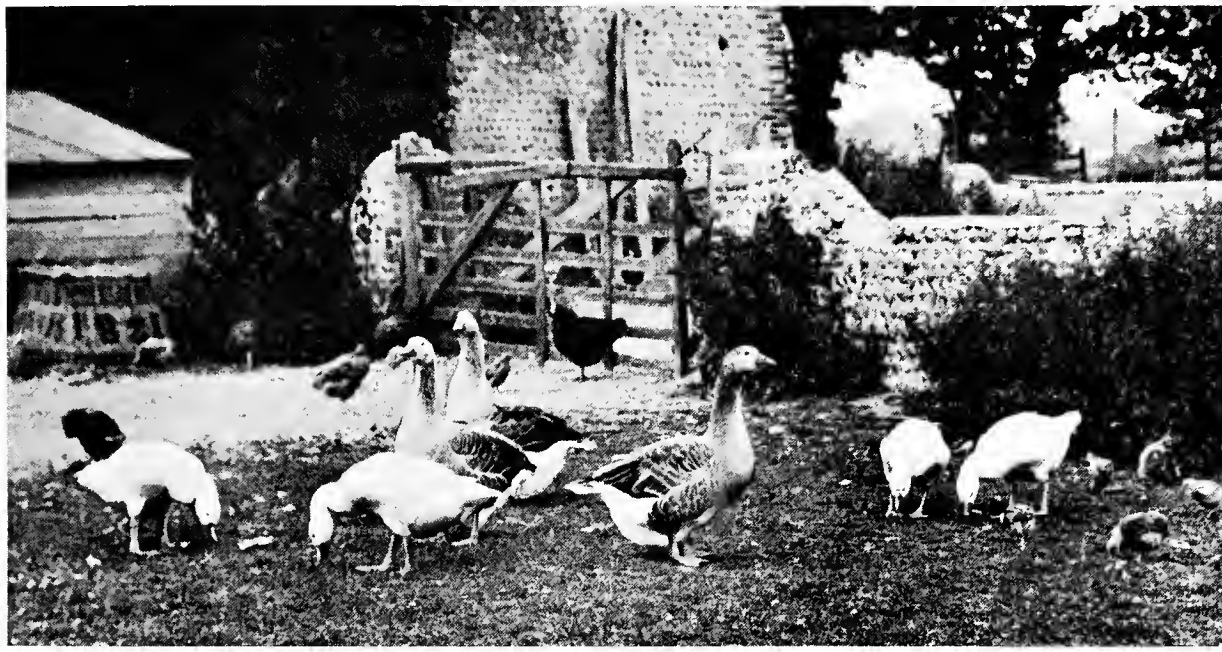


FIG. 3. EMBDEN (WHITE) AND TOULOUSE (GREY) GEESE WHICH BRING PROFITS TO THE ORDINARY FARMER

The Importance of the Poultry Industry

It is only in comparatively recent times that the poultry industry of this country has been considered of sufficient importance to merit serious thought; but we now have the Ministry of Agriculture strongly supporting us, and are beginning to build up a national organization. Fifty years ago, those who advocated poultry-farming on commercial lines or as a paying branch of agriculture were looked upon as little better than fanatics. Admittedly, before that time there were men who specialized in poultry produce as distinct from exhibition stock. For instance, in the south-eastern counties of England the breeding and fattening of table fowls was a recognized branch of agriculture and had been so for nearly a hundred years. Then, too, in Buckinghamshire and part of Bedfordshire duck raising was carried on extensively, although in most districts in comparatively small units, when one considers the large flocks of ducklings seen nowadays. In the East Riding of Yorkshire, also, farmers were turning their attention to egg production, and at least one of them had commenced to fatten fowls on the approved Sussex system, having employed a trained fatter for that special purpose. Poultry-farming, moreover, was being seriously considered in Lincolnshire, while poultry-keepers in Devon and Cornwall, at that date, were noted for the quality of the eggs and market chickens they produced.

However, in those times poultry-keeping was not an industry. It was then only a branch of agriculture, and a small branch at that. It was not looked upon, generally, as a commercial proposition. The poultry were kept on the farm simply to provide the wife or daughter with pin-money. It was suitable work for the "henwife," but not for men. What food was required for the birds in the way of grain and meal

was taken from the bins or sacks and never charged to the poultry account, because no accounts were kept. The corn was home-grown; and in those plentiful times the farmer never kept count of what went out to feed the feathered stock. At most farms within

FIG. 4. THE FARMYARD FLOCK
A mixed flock of fowls, and a trio of turkeys, the "gobbler" being a fine Mammoth Bronze

my ken in my youth the woman who looked after the poultry could have what she wanted in the way of corn just for the taking—it was there for the animals. Winter eggs were practically unknown, and what chickens were available for market were "killed off the run" without any preparation, and generally full of food.

For many years those who raised stock in Great Britain had enjoyed a world-wide reputation for producing beautiful thoroughbred animals; and breeders from all parts of the globe depended upon us for new blood with which to improve their own strains. It was so with poultry for exhibition, and of recent times it has been so with pedigree-bred laying birds. Consequently, the poultry Fancy being at its zenith, and our export trade in prize stock amounting to a very considerable item, it naturally came in for a great amount of attention. We are still first-class stock raisers; and it is very possible that the ancient practice of breeding Game fowl—the Game cock or fighting bird of old England—contributes in no small degree to the development of those special faculties we possess. It is not surprising, therefore, that at the time of which I write, few thought much of breeding poultry merely for the production of market chickens and eggs. The best prices were obtained for pure-bred stock.

It was my opinion, based on practical experience, that unless there were some very drastic changes, for which many of the best authorities were agitating, poultry-farming as a special business would never yield the wherewithal necessary to enable the owner to pay rent and taxes, wages, depreciation, food, and other bills and leave him a fair income. Poultry-farming did not prove remunerative when undertaken as one's sole occupation. As I found, in those days, keeping utility poultry on a large scale for market fowls and eggs might support its workers; but it did not yield sufficient surplus to satisfy expectations or to guarantee a large outlay of capital. We were content to draw our supplies of table poultry and eggs from France and Denmark and other Continental countries. However, the demand for these commodities began increasing at such a rapid rate that people in this country eventually awoke to the vast possibilities of the business. They were made to realize that an almost unlimited market existed at their own doors; and so the value of poultry as a source of income came more fully to be recognized.

Keeping Poultry on Commercial Lines

Hence it is that nowadays poultry farms, run solely on commercial lines and as a means of livelihood, are to be seen in many parts of the country. Agriculturists, too, are taking the matter seriously in hand, many of them having very considerably increased the quantity and improved the quality of their feathered stocks. Some, indeed, have acknowledged to me that when everything else failed, the little old despised hen had been about the only profitable thing on the farm; and I know of more than one farmer who is casting everything else aside to engage in the poultry business on a large scale. Moreover, the number of

FIG. 5. ON THE FARM
A cart shed converted into a fowl house and scratching shed

urban and suburban dwellers who have a few laying hens in their back gardens is on the increase. Much then, is being done; but with all this advance there is little fear that production will be so heavy as to make it unprofitable to keep poultry. It appears to me

that what we are at present suffering from is more like under-production, because we are unable to put on the market sufficient home-produced eggs and poultry to take the place of those sent in by foreign competitors.

In my opinion one of the best ways of reducing the imports of such commodities is for poultry-keepers to make their products plentiful and within the reach of people with modest purses. Eggs and poultry must never become luxury articles. The public must be shown this, because only in such a way will home consumption be increased and the poultry industry be a thriving one. It is the height of folly to imagine that poultry-farming is a "get-rich-quick" business. Such it undoubtedly appeared to be to some who took it up in the boom years immediately after the War; but they soon found out their mistake when the inevitable slump followed. There will always be a reasonable return from poultry for those who are competent to manage them. Success is within the reach of all who will apply common sense to their methods, no matter whether they be working on a large or a small scale, and provided always they select the system most suitable for their particular circumstances. That is a very important point, because while there are many roads to success, it is the choice of the right one at the beginning which makes all the difference between success and failure.

FIG. 6. SIX-MONTH-OLD CROSS-BRED GOSLINGS MASSED FOR THEIR EVENING MEAL

There is no valid reason why Great Britain should have to import such valuable food-stuffs as eggs and table fowls. The reverse, in fact, might well be the case, because we are born stock-raisers. At any rate, we should produce sufficient of these commodities to satisfy our own requirements, even should the consumption of them double or treble the present quantities. There is not the least excuse for any shortage of home supplies. We have the best climate in the world for the breeding of live-stock; we have the land, the capital, and the brains. We are thoroughly well equipped; and we lack nothing to make poultry husbandry one of the greatest industries in this country. It is surely in our own interests, therefore, to take up the subject in a serious manner, so that in time, by the very plenitude and excellence of our products, we shall prevent foreign eggs and poultry entering into competition with us. If our markets are a source of profit for producers beyond our borders —as, indeed, they must be, when one considers the enormous quantities of our imports—it is very obvious that they must be more profitable to us.

Assuredly then we must organize; and that is where, until quite recently, we have been behindhand. We have been rather unwilling to surrender our individual freedom for the common good. But such valuable assistance is now being given by certain Government officials in the way of marketing poultry produce that there is every reason why we should combine. Much can be done by individual effort; much in fact has been and is being so accomplished. Nevertheless, a sound business organization among the actual producers cannot fail to do good, without in any way forcing consumers to pay more than the goods are worth. As long as I can recollect there has always been a working arrangement in the trade, even in that section of it known to poultry producers as the "higgler." Those middlemen, who still flourish in country districts despite the establishment of packing stations, have their own organizations to arrange prices; hence the same should exist among those who produce.

Specialization

The tendency of the age is for specialization, more and more concentration on special departments; and poultry-farming in the future will be most successful when this is carried out. The commercial farmer, indeed, must specialize; the progressive man does so and builds up a reputation in one particular branch. It may suit one to concentrate on the production of eggs for market and to become a commercial egg-farmer. Another may choose table poultry as his speciality and include the fattening of the birds. A third could turn his attention to the pedigree breeding of layers. Others might specialize in the supplying of fowls of a suitable age for autumn and winter laying, or cater for the ever-increasing demands for day-old chicks of pure breeds or recognized sex-linked crosses, or for three-month-old "growing" pullets, while there is also the Fancy, in which to-day utility is being combined with beauty in specialist breeding.

There are many sections of the poultry industry, and any one of them can be selected for special concentration. No matter which branch or "line" is chosen it must be first and foremost, and everything in connexion with it must be very carefully considered. It is then a question of detail, nothing more; and the man who has the head for it will succeed.

No doubt some of you who anticipate going in for fowls will have heard that "poultry-keeping does not pay." That, certainly, has been the experience of some; but keeping poultry successfully is not a difficult matter. Let me admit that there have been failures; and failures there are likely to be among beginners who rush into the business on a large scale with practically no experience in raising fowls. Failure in such circumstances is almost inevitable, for, of a truth, one must learn to walk ere attempting to run. But the great thing about poultry-keeping is that one can start in a small way and enlarge one's scope as knowledge is gained.

To be a successful poultry-keeper it is not absolutely essential to have a large acreage. Success is within the reach of those with no more space at their disposal than a garden, and with the sole object of providing the household with new-laid eggs and an occasional fowl for the table. And, as I know, more than one very successful poultry-farmer to-day found his back-garden experience of valuable assistance to him when he eventually launched out. Success will result when common sense and business acumen are brought to bear on the keeping of poultry. It depends more on care and attention to detail than on genius. There is room for thousands of poultry producers without in the least overcrowding the business. Let the beginner make the right start, with quality rather than quantity, and he will find that there is always a market for reliable produce.

CHAPTER II

THE QUESTION OF ACCOMMODATION

HAVING decided to take up poultry-keeping, and that part of it which deals with hens as distinct from ducks, geese, and turkeys, the first thing to determine is the best system to select for the accommodation there is at one's disposal. This is a subject that can be very easily settled by the novice who must confine his activities to the garden, because in all probability his choice will be limited to some form of intensivism. At any rate, he can scarcely go into poultry-keeping on extensive lines. Of course, all who contemplate making a start are not restricted to such small quarters; many have the opportunity of beginning on land of considerable extent. When land is no object, as, for instance, where acres of meadow are available, it would, however, be the height of folly to start as a poultry-keeper on a large scale. Simple creature as is the hen, simple to those who have carefully studied her ways, she must be understood ere one can hope to get the best out of her. And there is no better way of doing so than by keeping fowls in such small numbers that every detail connected with the subject can be thoroughly mastered.

It is one thing to keep fowls, but quite another to make fowls keep those who look after them. Yet this latter is the aim of people who take up poultry-farming as their sole means of livelihood. Even when one is indulging in poultry-keeping as a hobby, as a welcome change from the everyday round, it is only by understanding the hen that the greatest satisfaction can be got out of it. How much more essential is it, therefore, to master the subject by practical experience on a small scale before taking up poultry-farming as a business, than to rush into it without knowing how to manage the hen. It has been by such folly as the latter that failure has inevitably resulted; and thus, in some quarters, poultry-keeping has created prejudices which are ill-founded. No matter, then, which system it is intended to adopt for accommodating the stock, give it a thorough trial in a small way before deciding on it as the best for the circumstances.

And so we come to a consideration of the different methods which are being successfully followed to-day. The keeping of fowls as far as accommodation is concerned can be divided, broadly, into three sections, and these are free range, semi-intensively, and intensively. Each section, however, can be sub-divided, because of a truth there seems to be no end to the number of systems. Briefly explained, free range means allowing the birds to wander where they like, the method that is commonly practised by the general farmer and by poultry-keepers in the neighbourhood of moors or commons. The fowls have complete liberty, as far as such liberty is permitted by law, and are not confined by fencing. The semi-intensive method restricts them to large or small runs, according to the size of the flocks and whether they are planned out on grass or arable land, in garden or orchard, although generally on grass. The intensive system, in "poultryological" phraseology, means keeping fowls without any outside run, that is, either in a specially constructed house, or caged in batteries or "egg-factories" as has been demonstrated of late; which latter is indeed extreme in degree.

Free Range

It will be readily understood that to permit poultry to range freely one must have a very considerable acreage of land at one's disposal; hence it is a method for the farmer, the agriculturist, rather than the poultry specialist. It is, beyond question, the most economical way of keeping poultry, no matter whether the stock be waterfowl or turkeys or almost any class of "hen"—layers, breeders, or growers—provided it is not in a fox-hunting district and that vermin can be kept in check.

One of its greatest advantages is that the birds spend practically all their time out of doors, while at most seasons they are able to find much valuable food, thus enabling their owner to economize in housing and in meal and grain, while it certainly does ensure the stock being vigorous, and able to produce strongly fertilized eggs for hatching. It was once thought that the complete freedom the birds thus enjoy, although being beneficial from spring to autumn, would be detrimental to the production of winter eggs, and especially from pullets who should then be coming into lay. For such fowls as the latter, often nervous little creatures when nearing their season for egg production in late autumn or winter, free range was seldom if ever recommended, and special winter quarters were assigned to them in the form of modern laying houses.

During the past few years, nevertheless, it has been my experience that spring-hatched pullets which have been range-reared will produce an excellent quantity of eggs throughout a normal winter on free range, granted the land is suitable, that is, reasonably well

drained, having a southern aspect, and with the usual natural shelter of hedge or spinney. This is what I have found in the south of England; and good results have been obtained without employing the large modern laying houses which are generally such a feature on commercial egg-farms.

I have succeeded with nothing more elaborate than small colony houses and Sussex night arks which are used solely by fowls as their sleeping quarters. It would be a great mistake, however, to attempt this particular kind of range accommodation on a bleak and wind-swept field, no matter how well drained the land may be for the actual run. It is on such a place as this latter that the scratching-shed type of house is essential for the laying stock during the dreary months; and it must be a very sturdily-built house, too, so that it will not be blown down during a gale.

FIG. 7. ON FREE RANGE

The Value of Stubble Land

Contrary to what many poultry-keepers appear to imagine, fowls which enjoy free range are not necessarily restricted to pasture land, because they may certainly be permitted in orchards, and on arable land, particularly when the birds are in their young and growing stage. They will also benefit by being turned on meadows after the hay has been lifted, and on stubble fields cleared in autumn. When such land is of very considerable extent and several of the small roosting houses mentioned above are in use, it is generally considered advisable to place them in a row a few yards apart, rather than in corners of the fields. Thus each house will have its own colony of birds, and any tendency for the fowls to overcrowd in the sleeping quarters will generally be prevented. In this case the size of the flock or unit must be governed by the nature of the land. For instance, on pasture which is used by the farmer for grazing stocks the maximum should be 100 fowls to the acre; and such a number might well be the limit for meadows after hay time, although these latter, like stubble fields, are often much more heavily stocked for the first few weeks after they are ready for the birds.

In most orchards, however, 200 head would not be too many per acre. It may be as well to remark that "stubble"—land from which corn has been harvested —is more suitable for adult birds which are going through their moult, or for what poultry-men know as "growers," i.e. four-month-old to six-month-old pullets being brought along for laying or reared for breeding purposes, than for young hens or early-hatched pullets which are steadily laying in autumn. New grain, such as is found by the birds when they are being "stubbled" has a decidedly relaxing effect; hence when they are first allowed on such fields care must be observed in their feeding. As regards keeping fowls in orchards, I suppose there will always be some

difference of opinion as to whether such places are beneficial. I think, however, that many fruit growers in this country fail to realize the great benefit poultry can be in grass orchards—as distinct from fruit plantations of trees and bushes on land that is ploughed, and from which adult stock is better excluded.

Utilizing Orchards

From a practical point of view, and granted proper management, fruit and fowls make an excellent combination—certain fruits and certain fowls, not all or any of either kind. Thus, while standards and half-standard trees are suitable, it is not always so with bush or pyramid trees, because the birds may very easily damage the buds or fruit of the latter. Then, too, the general-purpose and contented breeds of fowl are preferable to the light and non-sitting birds, which fly almost like pheasants; and these latter must have their wings clipped, locked, or clamped to keep them on the ground. It is said that the stems of young fruit trees can be damaged by poultry, and especially when, in springtime, insects begin to move up them. But, if the right type of tree is chosen, and free range of old rather than young orchards is permitted, the birds will do no harm but will, on the contrary, keep the trees clear of pests, and improve the fruit crop by devouring noxious grubs, eggs, and insects, and by manuring the land.

My own experience of keeping fowls on land on which bush fruit is grown is that adult stock must be removed at the time of year when they do harm. They may safely be allowed such range throughout winter and early spring, since by their constant scratching and dusting they aerate the ground, while the bushes provide them with appreciable shelter against the cold winds that generally prevail at that time. Nevertheless, when the little green buds appear the birds must be removed, otherwise they will eat them (and the flowers also, as far as they can reach), and, consequently, the crops will be poor. The bushes can, of course, be netted; but it is expensive so to protect them that damage cannot be done. It is safe to leave chickens and young stock among bush fruit until the fruit is nearly within their reach, unless they happen to be particularly active birds and perch on the branches, which would interfere with the crop.

FIG. 8. ON STUBBLE LAND

I find, also, that both young stock and adults can generally be left among fruit trees all through the year, if certain precautions are taken in the way of diet, and the birds have a free outrun on grass. This is so if a small quantity of fallen fruit—that which falls when "wormed" and is only partly grown—is mixed in their wet mash, boiled and pulped with the vegetable portion of that soft food, as is my custom when such is available. However, gorging on half-ripe raw apples, as some fowls will do, is apt to cause internal derangement; hence, I always endeavour to shut my birds in their houses at night and clear the land of the fallen fruit before they are liberated in the morning. It prevents them destroying fruit that might otherwise be used for cooking, besides allowing them no chance of falling sick. Gorging on raw and rotten apples is not good for poultry.

On the whole, though, orchards make excellent runs for fowls. Birds so ranged pick up much natural food. Insect life is in abundance, and there is a plentiful

supply of herbage, sweet and always fresh, while they never lack for fresh air. They keep the trees clear of all insects so that few, if any, grease-bands are required. As a friend in the horticultural line once remarked to me, they come to the rescue when the fruit grower is worried by thoughts of winter-moth or March-moth, for there is no doubt they devour many of the wingless female moths before they can get on to the trees. Other pests, too, such as apple blossom weevil and woolly aphis, will be greatly reduced. The trees provide most welcome shade in summer, as well as protection from biting winds in winter. Chickens can be reared especially well in such spots, as they can have sunshine and shade at will. Let poultry range such land, therefore, whenever it is available.

I have mentioned the benefits to be derived by fowls which are permitted to have free range; and the farmer who utilizes it in such a way has many advantages over poultry-keepers whose accommodation is of necessity fully stocked with birds. It must be admitted, however, that such freedom also has its drawbacks, although perhaps they are not numerous. No matter how many nest boxes there may be attached to the field houses, some of the layers, and particularly the young hens, will almost invariably select any other place in which to deposit their eggs. When carrying out poultry work under farm conditions I have discovered nests in most unthought-of quarters, in manger, loft, barn, and byre, in hedgerow—a common location for farm hens—and, once, on top of a hay stack. Discovering these nests does not lighten one's labour, although when they have been found it is a simple matter so to mark the spots that they can be included in the regular egg-collecting round of the day.

Of course, some hens are erratic birds no matter where they are kept; and they are not averse to playing such pranks when confined in wired runs. Admittedly, there are occasions when "stolen" nests are overlooked, however vigilant the attendant may be; and he is not made aware of it until he discovers a "lost" hen with a full brood of sturdy chickens which she has hatched off quite unaided. Such things often happen during spring and summer; and, as a rule, the hatch is a particularly big one.

FIG. 9. TRESPASSING!
Fowls in a cornfield ere the grain has been carted

Concerning Trespass

Before leaving the question of free range it is as well to mention that, although the poultry-keeper may live in a remote part of the country where neighbours are few, it is not always possible for his birds to have absolute liberty. It is a common belief that farm fowls may wander where they will over field, road, or garden. But this is not so, legally, and I mention it to prevent trouble that might very easily arise through ignorance of the law. So frequently has the question been put to me concerning the "rights" of free range poultry that I took legal advice on it; and it will be as well briefly to set down how matters stand. It is the law of this land that, with very few exceptions, a person who keeps live-stock must confine them within the bounds of his own premises; and if they trespass on the premises of other people and do damage, the owner of them is liable for the damage done. No man is bound to erect or maintain fences (and a hedge is a fence) in order to keep out his neighbour's live-stock.

It is for the owner of the live-stock to make all the necessary arrangements to prevent his stock trespassing on land belonging to other persons; and in the case of poultry this means preventing them breaking through or flying over fences. It is perfectly true that an occupier of land may be under a prescriptive obligation to maintain fences for the purpose of keeping out his neighbour's cattle. But cases of this sort are comparatively rare, and certainly unknown as far as poultry-keeping is concerned. The rule of law applicable to the keeping of poultry, therefore, is that a man who keeps live-stock must confine them within the bounds of his own premises; but the general right of poultry-keepers to allow their birds to stray on the highway has been firmly established. The highway is for the use of man and animals belonging to man; hence, if poultry on the highway are killed by motor car, bicycle, or any other vehicle, their owner can claim damages.

On the other hand, some people are under the impression that they may legally shoot, trap, or poison trespassing poultry. It is quite a mistake; it is, in fact, "against the law." No man is entitled to take the law into his own hands; that is, no person can make a law for himself in such a matter. He must make use of the remedies provided by law; if he does otherwise he will be liable for the damage done. There are only two remedies for persons who suffer from trespassing poultry, viz. (1) an action to recover the value of the damage done, and (2) the right of seizure, known as "Distress damage feasant." This latter is the remedy commonly applied to trespassing cattle—the animal is seized in the act of doing mischief, and is imprisoned until compensation for the damage done and the cost of impounding it have been paid.

Let me just add that, in the case of light breeds of fowl which can easily fly over the ordinary poultry fence, it is a simple matter to cut the long (flight) feathers from one wing—and only one wing should be cut, not both wings—and thus the bird will be unable to leave the ground. It can be accomplished in a few seconds with a pair of sharp scissors, and causes no pain whatever. So much then, for free range.

Keeping Fowls Semi-intensively

The semi-intensive system of keeping fowls means, in few words, restricting them to a given area of land, fenced in, and thereby allowing them to be the only occupants of it. The system came into popularity when it was proved that poultry could be managed successfully by people other than farmers and those who have a large acreage of ground at their disposal. And while, for many years, it was adopted only for small numbers of fowls, such as breeding pens, it has been found possible of late to run quite large flocks of layers on this system. By some authorities, indeed, it is claimed to be the one by which the land can be stocked to the maximum, and safely stocked with as many as 400 head of hens or pullets to the acre. As a rule it is carried out on grassland; and although there are several ways of keeping birds semi-intensively, probably most of them include a house on the scratching-shed principle, which permits the fowls to use it not only as their roosting quarters but also as their "run" during rough weather, and especially throughout winter, which helps to keep the land in good condition.

More than twenty-five years ago I suggested its adoption as an improvement on back-garden poultry-keeping—which, at that time, had unfortunately earned a somewhat bad reputation in many quarters—and as a system of poultry-farming for men who, anxious to go into the business, were unable to employ outside help. Although it met with much opposition at the time, it is to-day probably the most popular form of poultry-farming for people who have to manage things single-handed. Moreover, a somewhat similar plan of penning the birds, in enclosed runs, is adopted at practically every laying test in the country, of which tests there are about sixty in Great Britain and Northern Ireland with over 27,500 fowls competing. That it is, therefore, a successful method of keeping poultry can scarcely be questioned.

The plan I advocated, to enable the maximum number of birds to be kept on the space at disposal, and in healthy condition for laying or breeding, was to divide an acre of grassland into sixteen equal runs, and to keep twenty-five fowls in each. Admittedly, extra expenditure was necessary for the fences, although when it was possible to fence off square sections a considerable saving was effected in wire-netting. But once established, the system gave excellent results because, as the layers were being kept in small flocks, the maximum of egg production could be obtained from them. Moreover, the adoption of that system enabled the beginner to start in a small way with two or three pens, leaving the remainder of the ground to be utilized for breeding stock, chickens, "growers," and layers, as well as for cockerels being prepared for table. It gave him the opportunity of building up as he gained experience. In addition to this, also, it kept him in such close touch with his stock that he could immediately attend to any bird which was off colour. Old as this particular system may be, it is still one that I can confidently recommend to anyone who wishes to start on a small scale after having had some experience of keeping hens in a garden.

Another style of semi-intensive poultry-keeping recommended by an old friend of mine many years

ago, and which I saw in practice on some allotments in the south of England, proved to be a most satisfactory way of combining hens and market gardening. The plot was divided into four square parts, and the fowl house was fixed in the centre of them, the fencing in use being sufficient wire-netting hurdles to surround one of them. The house had a trap-door at each corner, so that the birds could be liberated into any section required, the hurdles, of course, being moved to form the enclosure.

From about March to August the fowls occupied one section as their outside run, the others being cultivated. Section number two was cropped so as to be clear some time in August, and the birds were turned on to it at once, their original run being dug and planted with cabbage to come in early in May. As soon as the crop, late potatoes, was taken up in the third section the hens were turned on to that freshly-moved ground, and they remained there until the fourth section was ready for them, which was probably in March again. In this way, it will be seen, the fowls occupied three sections each year; and not only did they enrich the land until it was maintained in the highest state of fertility by them alone, but they also destroyed wireworm and other plant parasites, so that the land grew more than it did before, while the birds were considerably benefited by fresh ground.

Yet a further way of keeping fowls semi-intensively was advanced recently in connexion with fruit growing, to get the best results from the even spreading of manure and the greater destruction of insect pests; and since I have seen it in operation in two or three districts it is worth mention. Each acre of orchard land is divided with wire-netting hurdles into five sections, and in each is placed a house to hold twenty-four fowls. If these fences were permanently fixed, it can be imagined that extra labour might be involved in gathering the fruit; but since the hurdles are removed when the trees are ready for clearing, this expense is obviated. In one orchard I found that ducks were being kept instead of hens; but, while

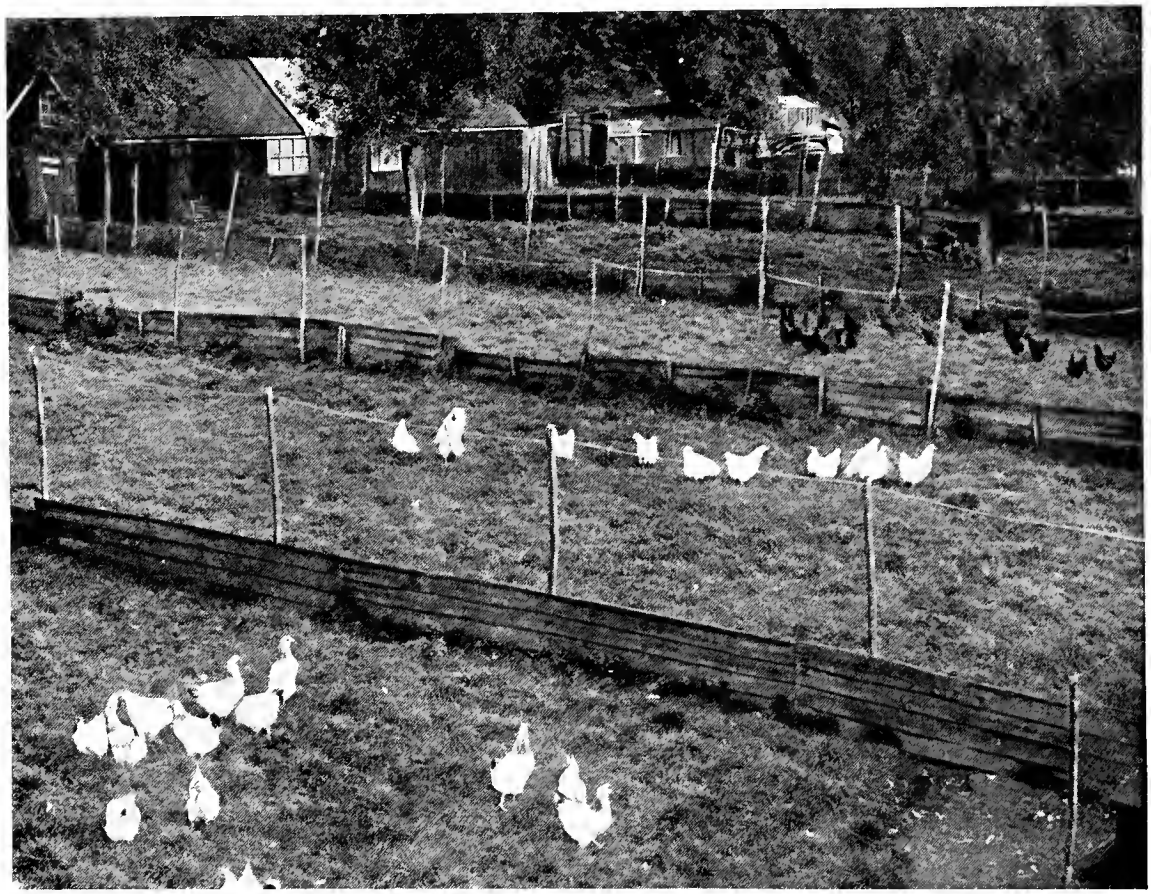


FIG. 10. ON THE SEMI-INTENSIVE SYSTEM

Breeding pens of Light Sussex, White Wyandottes, Rhode Island Reds, etc., provided with spacious grass runs

they are quite as good in supplying valuable manure, and are probably almost equal to hens in destroying insect pests, their inability to scratch the earth puts them behind fowls at clearing the ground of grubs and weeds. On the other hand, ducks can be more cheaply housed, while a 2-ft. high wire-netting fence is sufficient to confine them. The cost of the necessary equipment is comparatively small, hence the plan might well be tried first on a small plot, to observe the effect upon the crops, and extended or rejected according to the results.

One of the greatest benefits of keeping fowls on the semi-intensive system is that, while it permits of quite natural conditions when the runs are spacious—they should allow at least 12 square yards for each bird—and, moreover, ensures strongly fertilized eggs from breeding stock, so planned, it provides poultry with ample protection from foxes and similar vermin, granted that the fences are well made and kept in sound condition.

"Folding" the Birds

During the past year or two the fold system of keeping fowls has come much into vogue again, as a means of preventing disease from fouled land. I say "again," because while there are advocates of it who are apparently under the impression that it is of quite recent discovery, such indeed is not the case. I should not like to say how long ago it is since it first came under my notice; but it was in my early days that it attracted my attention, during a visit I was paying to a Leicestershire farmer who was one of the pioneers of poultry-keeping as an important branch of husbandry. His fowls were certainly not kept in houses with slatted floors, simply because at that period the Sussex night ark—the original house with a ventilated floor, and in use for hundreds of years previously—was practically unknown beyond the borders of Sussex, while even in that county chicken rearers recognized it as suitable for young and growing birds only. Nevertheless, that farmer's laying stock was kept in very small units, each with a house to which was attached a 2 ft. to 3 ft. high wired-in enclosure; and they were moved frequently enough to prevent any fouling of the land. As far back as 1908, too, the fold system was being strongly advocated, although under another name, because the outfit was known as the "Portable House for the Small Holder." The principle, however, was the same, and the "house" consisted of an apex-shaped shelter and wired run combined, which is a somewhat common design among present-day fold units.

The folding system of to-day may be described, briefly, as a fowl house with a completely wired-in pen attached; and not too cumbersome to be easily moved. It is advocated not with the idea of forcing the birds to clear the land of herbage or to subsist largely on natural food and thus effect an economy in the corn bills—as some people appear to imagine—but to enable them to improve the land by "working" and lightly manuring it. An essential part of the system, in fact the most essential part of it in my

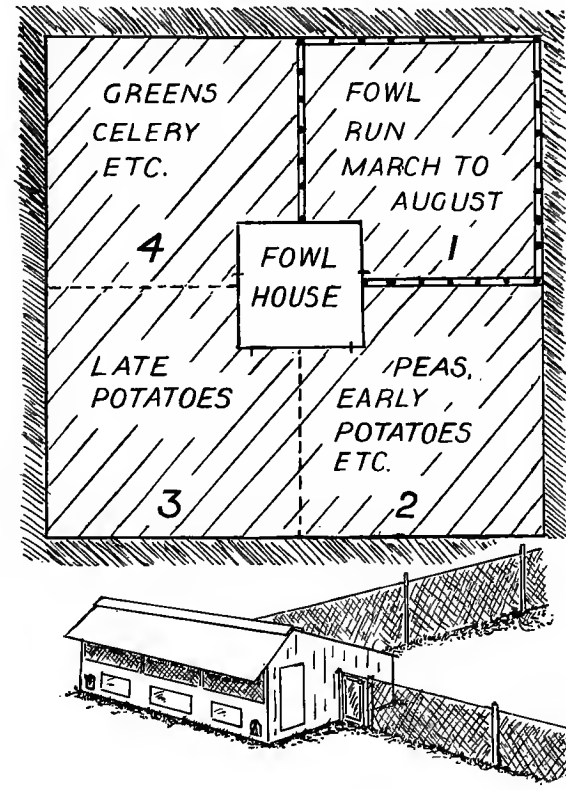


FIG. 11. ON AN ALLOTMENT

No. 1 plot is occupied by the fowls from about March to August. No. 2 is cropped so as to be clear some time in August, when the birds are turned in, and No. 1 is then dug and planted with cabbage to come in early in May. As soon as No. 3 is cleared the fowls are turned on and remain there until No. 4 is ready; thus they occupy three plots each year

opinion, is to move the fold every day, so that no patch is occupied for a longer period than twenty-four hours. Just where it can be classified when dividing the accommodation for fowls into three broad sections it is difficult to say. It is certainly not free range, because, while it can be practised on an extensive area as well as on a small plot, according to the size of the unit and the numbers employed, the birds are decidedly confined. Yet, one could scarcely term it semi-intensive in the strict sense, while few would refer to it as intensive poultry-keeping as this latter system is known to poultry authorities.

As many as fifty adult fowls can form one unit under this modern method; at least such a number

has been suggested. For all practical purposes, nevertheless, and certainly for the more convenient handling of the stock, not more than half that number of birds should be allowed. It must be remembered that the pen has to be shifted daily, so the more easily this can be accomplished by two men or boys the more likelihood is there of the work being thoroughly done.

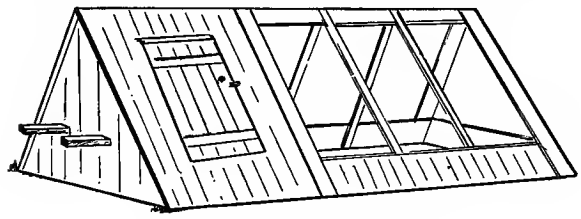


FIG. 12. A FOLD OF 1908

Known then as a " Portable Fowl House, suitable for use on a small-holding." It was not fitted with a floor, either slats or wire; and the perches, protruding beyond the end (left), acted as handles. The "run" was covered with wire-netting; the sleeping place was ventilated by means of small holes under the ridge at each end, while the door between it and the run was the usual pop-hole

Admittedly, it may be no great trouble on a farm to utilize a horse for the move; but since farm horses these days, if they have not been superseded by the mechanical tractor, are generally fully employed it is seldom one of them can be spared to do the work regularly. If for no other reason, therefore, the unit should not be a large one, and about two dozen adult birds should be the maximum. There is, however, another reason against the formation of big flocks under the fold system; the birds are so closely packed for outdoor work—the average allowance of run, excluding the house, is about 2½ sq. ft. a head—and often inclined to be nervous under the conditions, that small rather than large units will make for contentment, and thus better egg production will result.

It is hardly necessary to mention that the structure must be very sturdily built, not only to withstand the strain of the daily move—and especially if the folding is done on arable land—but, when on grazing ground, to prevent inquisitive cattle damaging it. Some of the designs on the market—several types are now being made—are altogether too flimsy for use on other than a tennis lawn. They would not remain intact for six months, were they subjected to the rough handling they would almost invariably get on ordinary farm land. Details of their construction will be considered when dealing with houses. Suffice it to say for the nonce that they must be strong and easily portable.

Overcrowding is detrimental under any conditions, but much more so when adult stock is being folded; hence in no circumstances should the unit exceed the number of birds for which it is designed. Rather, in fact, err in the other direction, because as the fowls have to face all kinds of weather they must be kept healthy and vigorous. It has been suggested that the system is an excellent one for the breeding stock, that is, for mated pens of fowls; but my experience is that the hardiest chickens are obtained from birds which are given extensive range, and not from those which are so closely kept.

For the Farmer

The fold system has been advocated for the general farmer as an excellent means of spreading the poultry manure. That is certainly one of its good points, as I have proved to my satisfaction, while so good is the subsequent growth of grass that cattle and sheep graze freely where the system is in vogue. It also provides adequate protection against foxes and other vermin, of which ample proof has been afforded me at a neighbouring farm. Moreover, since there is no need to shut the birds in at night, the last round of the day can be well ahead of sundown, which means much for anyone who, like a friend of mine, keeps colonies of poultry on different parts of a 500-acre farm, with some of the houses located a considerable distance from the dwelling house. There can be no doubt that the fold system has its good points and that the general principles on which it is based are sound. It is making much headway; and there are farms at which it is the only one adopted for the laying hens.

One authority who is very keen on the folding of

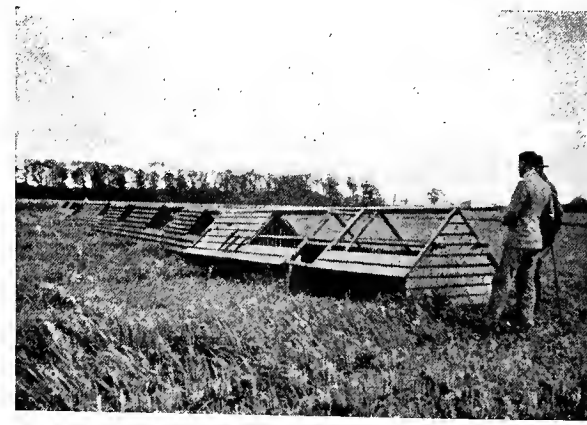


FIG. 13. THE FOLD SYSTEM

Each unit must be moved daily to ensure the birds getting the benefit of fresh land

fowls recently declared to me that it possessed so many obvious advantages that it seemed likely to be widely practised in the near future. It is, as I have mentioned, for use over either pasture or arable land (in rotation with cropping); but the greatest disadvantage of it in my opinion is the labour entailed in the daily move to ensure a large head of layers

being kept. It might be fairly easy on meadow land, even though all meadows are not like tennis lawns in texture and herbage; but arable generally makes very heavy going. It might possibly be better on stubble fields, although such land is not always of a nature that makes the moving of the pens an easy matter. I find that, except during reasonably fine weather, the daily change of run is apt to be shirked or, if undertaken, inadequately carried out. At no time have I found it light work to assist in moving the fold its own length or width; but, although one can get accustomed to heavy going even though not brought up to it from childhood, the task becomes irksome in the extreme when rains are continuous or the land is snow-bound.

For these reasons I abandoned the system after a year's trial, and utilized the folds for chickens and growing stock, for which purpose they proved satisfactory. I quite agree with those who are keen on folding fowls that an important feature of it is the birds being kept in small units, that control of an outbreak of disease is facilitated, while the risk of heavy losses through the rapid spread of a contagious disease is materially lessened. But this, of course, applies to other small unit systems, while risk of contagion is not lessened by the fact that the unit—a slatted floor house with a wire-covered run attached—is moved from place to place.

It is a mistake to imagine that slatted floors never want cleaning, because, while the bulk of the droppings fall through the slats direct on to the ground, labour is required to remove what remains, and especially if the birds are folded on arable land during a wet season. Moreover, these units, unless they are very sturdily made, do stand a risk of damage from large farm stock which may be grazing the same pasture, while there is the possibility of their being toppled over in a gale. They have their uses; but I prefer the modern laying house for the homestead, or Sussex arks, colony houses, or stubble houses for the fields. Such is my experience.

Garden Poultry-keeping

The production of eggs for home consumption by means of a few fowls kept in a confined space is a subject which cannot fail to appeal to many thousands of people in small towns and country places. At the beginning of this chapter I state that the novice who has no greater area than a garden for the purpose can scarcely go in for poultry-keeping on extensive lines, and that he will therefore have to adopt some form of intensivism. Such being inevitable, however, it must not be thought that he is necessarily forced to deny his birds a run. He can certainly, if so disposed, keep them entirely in a house, designed and fitted out in such a way that they will be on what is known as the intensive system; but this is not imperative.

It may not be possible to provide them with an open run, that is, one uncovered to the sky, although it might be managed where the ground is very dry, the slope or drainage good, and the space large. Still, I do not recommend the use of an open run unless it

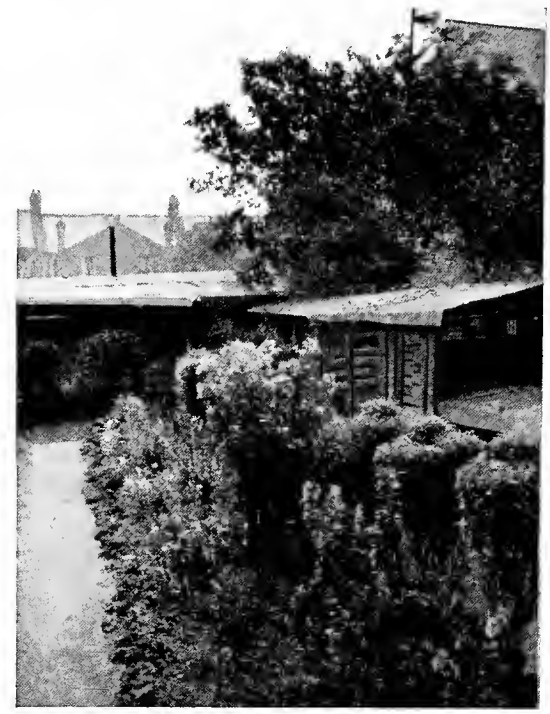


FIG. 14. A BACK-GARDEN FOWL RUN (COVERED) IN A LONDON EAST SUBURB

can be large enough to divide into two, so that one section of it may be cultivated while the other is being occupied, and thus there will be little fear of the soil getting "fowl-sick." Where plenty of space is available for such alternate runs by all means utilize it in that way, because good garden crops can be gathered from land which has been occupied by fowls. But allow the birds about 3 square yards a head.

When keeping hens in a small garden, however, and especially in urban and suburban districts, it is preferable by far to adopt the scratching-shed principle, that is, to cover the run so that in all weathers the birds have a dry place in which to exercise. This considerably simplifies matters, because not only can it be kept wholesome with less labour, but it is thoroughly hygienic and, in proportion to its size, can take many more fowls than an open space. In this case it may be made to any size, as long as it permits of nine square feet for each hen. Less than that might possibly be found suitable; but there must be no

overcrowding, which lowers the birds' vitality and interferes considerably with their egg production. It is much better to err on the safe side than to keep more than the place can accommodate. It is an advantage to have the run attached to the roosting house, that is, to have them built under one roof. It should be made nearer square than oblong, almost as deep from front to back as it measures from end to end; but in no case should it be long and narrow, inches the litter will last for a month or more before it requires renewing, and especially is this so if a little trouble is taken occasionally to rake off the bulk of the droppings and to throw over it a spadeful or two of freshly-dug earth. The side not adjoining the roosting house, as well as the back, must be solid, the latter being six inches or more from the wall (or fence) and not attached to it in any way, while the front should be fitted with wire-netting, except about one

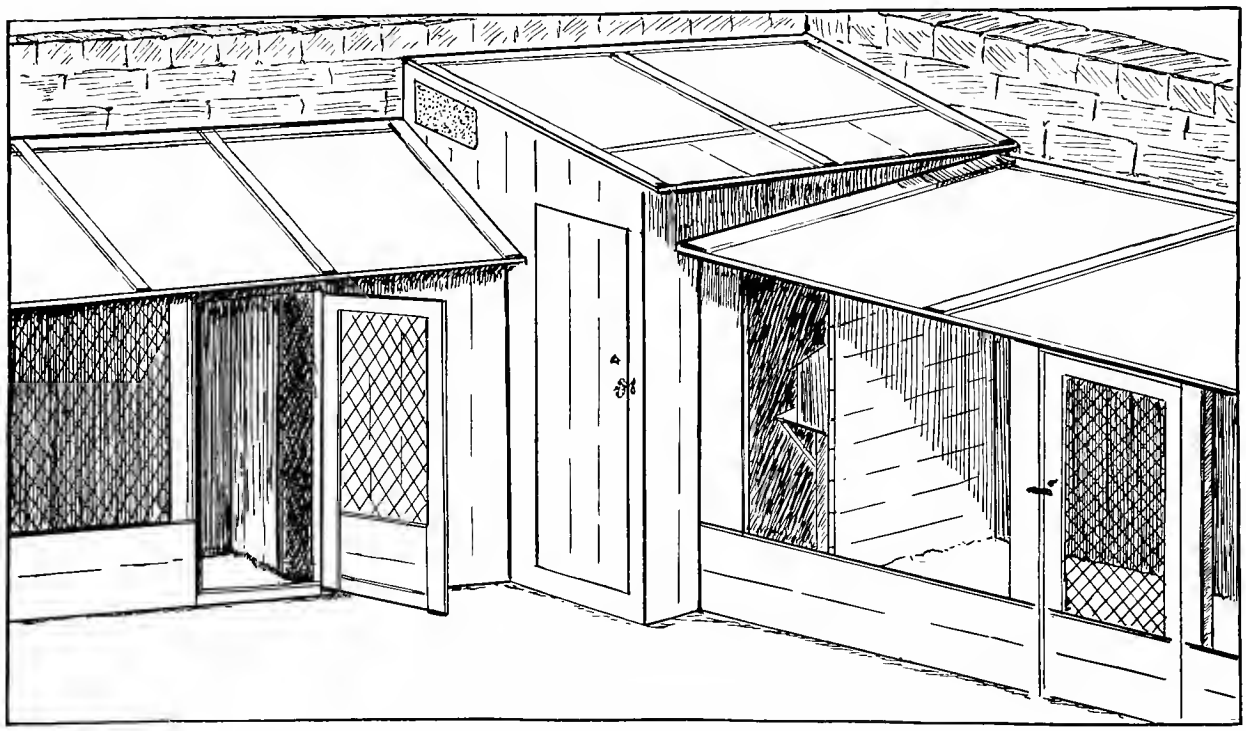


FIG. 15. FOWL HOUSES IN A LONDON (NORTH) BACK GARDEN

The roosting house, facing south, is 8 ft. long, 6 ft. wide, and 7 ft. high at the back, and has a perforated zinc ventilator. The roof is fitted with four panes of glass, which can be slid out during fine days. It contains three perches and a dozen nest boxes, three of which are against the partition (as indicated) and the others, in three tiers, on the right-hand side. The covered run attached to it is 12 ft. long and 7 ft. wide. It accommodates twenty-four hens. The covered run on the left is 12 ft. long, 4 ft. wide, and 6 ft. high at the back. It is used for rearing, a space of 4 ft. being partitioned off as sleeping quarters. The walls are faced with cement to ensure dryness

practically all front and no depth, since this shape is very apt to force the occupants to get in each other's way, which generally leads to bickering.

Perhaps the most important part of such a run is the floor; the foundation must be dry and sound. However, if it is made on the highest part of the garden, or at least in such a position that water cannot settle on it after rain, it can consist of earth mixed with broken chalk, fine gravel, or similar material, well hardened by rolling or ramming, and then covered with litter. This can consist of a mixture of earth and short rough straw, or of granulated peat moss from the bale; but on no account should ashes or cinders be used for the purpose, because the dust becomes a nuisance, while it gets caked and foul in damp weather. If put down to the depth of three or four foot at the bottom which might well be boarded to prevent any litter being scratched outside.

As a rule, this type of small run is roofed on what is known as the "lean-to" principle, and it is, for convenience, usually fixed against a wall or a fence with the higher side of the roof at the back. These arrangements, however, are faulty, the former because it will cause the interior of the run to be damp, and the latter because the downward slope to the front effectually prevents any sun rays from entering to brighten the interior. This may be thought an advantage in summer, but it is decidedly detrimental in winter, when warmth is most necessary for egg production and general health. Let the roof, therefore, slope the reverse way, even if the height of the whole structure has to be such that, according to some local

by-laws, no part of it must reach beyond the top of the dividing wall or fence.

It should here be mentioned that those who purpose erecting a run—or, indeed, a fowl house—in a confined space are well advised to consult the local by-laws in force (a copy of which may be obtained free of charge by any ratepayer, on application to the local authority) before commencing the work. It will generally be found, however, that if the simple requirements of the local by-laws are complied with, no objection is taken to the keeping of fowls under sanitary conditions. This, of course, is essential; the greatest cleanliness must be maintained. Moreover, the birds must be prevented from straying on to neighbours' gardens.

The Cock-crowing Trouble

There is, too, in connexion with the keeping of fowls in a garden, the question of cock-crowing. No one has any right to keep animals which are likely to cause annoyance to neighbours; and for this reason I should on no account suggest the keeping of male birds in thickly populated areas, because cock-crowing would then be a nuisance. At the same time, I cannot help thinking that in some cases these complaints are ill-founded, and it is perhaps as well that the many difficulties provided by law, in the way of persons who wish to prove that cock-crowing is an annoyance, generally act as a deterrent to such complaints being lodged.

However, it makes for one's own peace of mind to live amicably with one's neighbours; hence, if it is deemed advisable to keep a cockerel in a garden run —and there are many such places where a breeding pen can be maintained in sound, healthy, and active condition—it is not a difficult matter to obviate any possibility of complaint about early-morning crowing. Let the male bird be removed from the perch, when he has settled down at night after a good meal, and be put on straw in a basket or a small coop where he must squat—as he naturally does when sleeping—but cannot stand. He will soon get accustomed to this temporary confinement and it will not do him the least harm, while if the basket or coop is in a quiet place such as a cellar or a shed the bird will sleep peacefully until he is released for breakfast the following day.

Of course, if the garden poultry-keeper requires the eggs only for table and not for hatching, it is not necessary for him to keep a male bird, although quite a number of people are not aware of this fact. The hens thrive as well without him as with him; indeed, at some times of the year, and particularly while they are moulting, it is preferable to let them run alone. To test this matter a series of experiments was once undertaken; and there was conclusive proof that when hens were kept by themselves the eggs were produced at about 30 per cent less cost than from similar pens in which cocks or cockerels were kept. In some instances, also, the actual number of eggs produced was almost a third more from the hen pens than from others of precisely the same kind, managed in the same way, except that the presence of the male was permitted. Then, too, the presence or absence of the male bird does not affect the quality of the egg.

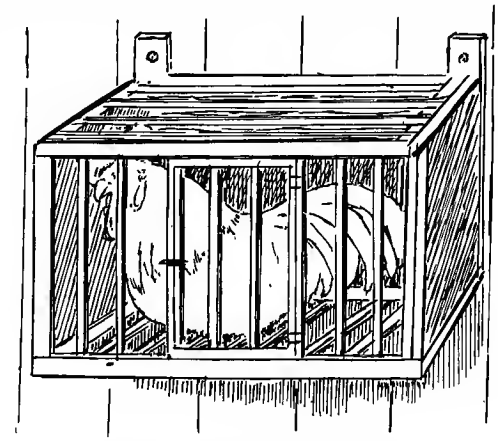


FIG. 16. THE COCKEREL CAGE

To prevent a male bird crowing during the night, he should be removed from the perch in the evening and put into a small coop where he can squat comfortably but cannot stand. This coop or cage (with sparred top, bottom, and front), can be fixed inside the fowl house, the top being so protected with wire-netting that hens cannot roost there

These points are worth noting when economy is being studied.

It seems to be proverbial that horticultural enthusiasts regard the hen creation as natural enemies; but there is no reason why a fowl run should in the least detract from the appearance of a garden. No matter how neatly the structure be made or how well it be painted, do not let it be too conspicuous. I do not mean that the owner should not be proud of the fact that he has such live-stock on the premises, or that the run should be set up in any odd corner. It must be in such a position, facing south as a rule, that the inmates are able, in winter particularly, to get the full benefit of the sun, and fresh air always. But if it be thought that the fowl pen will spoil appearances, what is to prevent one fixing up a light screen, some three to four feet in front, to support climbing roses, honeysuckle, or something to please the eye? It could be arranged in such a way that the interior of the run would not be dark. More than once I have seen privet hedges acting as the screens; indeed, some years ago I had a garden run, and it delighted an old friend who was a keen horticulturist. And to such an extent did that camouflage appeal to him that he became as enthusiastic a poultry-keeper as he was a gardener.

Planning the Runs

It will be gathered from what has already been said in connexion with providing accommodation that it is not necessary to plan runs for poultry which enjoy absolutely free range. The birds go where they will, because all places are alike to them. On some farms, however, where a speciality is made of commercial egg production, the poultry section is fenced around so that the fowls are quite distinct from other stock; but, while the birds are housed in small units, they are allowed to intermingle freely during the day, because there are no intermediate fences.

FIG. 17. A WELL-SHADED RUN

Light Sussex pullets in a well-shaded run. The wattle hurdles arranged along the bottom of the fence act as a wind break and also prevent fighting between fowls in adjoining pens

At one such farm as I have in view, about 6000 layers are ranged, each house accommodating twenty-five birds, and at another there is a larger flock, with houses holding fifty birds each, while at a third nothing more elaborate than Sussex night arks is provided. Some of the houses have wire-netting floors (without perches), others are merely field houses, while the arks are slatted floored; but in no case are the night droppings allowed to reach the ground. The houses are periodically moved. Although the birds are in large flocks and have the freedom of these fields they sort themselves out into colonies at eventide, each of which apparently returns to its own roosting place. But, surprising though it does appear to the novice at poultry-keeping, there is seldom any overcrowding in the houses or arks.

When it is the aim to have breeding pens—of pedigree-bred fowls in particular, or to rear stock for any special purpose, or to have on hand some reserve birds during the breeding season—then it is well-nigh imperative to divide the land and to apportion to each pen its own run. It is, of course, essential when the semi-intensive system is adopted. On some poultry establishments it is the custom to flock-mate the breeders; that is, several males and females are kept together, the proportions generally being one cock to every dozen to twenty hens. This arrangement, however, has never appealed to me, simply because in too many instances it results in one of the male birds becoming far too masterly, which thoroughly unsettles the others and almost invariably leads to a large percentage of clear (infertile) eggs. And, as can be imagined, this is very detrimental if any trade is being done in eggs for hatching. Special pens, therefore, are much preferable.

In planning out land for such purposes it is most unwise to attempt too rigid enonomy, because the runs have to be permanent, if not all through the year then generally during the greater part of it. For this reason then, it is advisable to allow not less than 12 square yards of grassland for each bird, exclusive of the space occupied by the house. If more than this can be allowed it will be a decided advantage for the breeding stock, because the endeavour must be to keep the herbage in reasonably good condition. Nothing looks worse than a small grass run which is carrying too much stock, and nothing is worse for the health of the birds penned on it. An overcrowded run becomes quickly foul and will cause untold trouble. Hence it is advisable, when arranging the enclosures for the breeding pens, to be generous in the way of space.

In a previous paragraph, dealing with the keeping of fowls in a garden, I suggested that the small patch attached to their roosting house should be made nearer square than oblong. In the planning of an extensive area of land that has to be fenced in, this is more important than might at first appear, for not only does it effect considerable economy in wire-netting used for the fences, but it encourages the birds

to spread over the whole of the enclosure rather than to keep to that part adjoining the house. I suppose it is generally known that British wire-netting—which is undoubtedly the best material to use for fencing poultry runs—is put up in 50-yd. rolls. Hence, for example, while one roll will enclose a plot of ground 12½ yd. square (an area of slightly more than 156 sq. yd.) a similar length of netting will be required for a patch 15 yd. by 10 yd. (150 sq. yd.) or one 20 yd. by 5 yd., covering 100 sq. yd.

For the better working of the land by the birds it is sometimes the custom to place their house in the centre of the run. In my experience such an arrangement has one advantage only; on a situation that is devoid of hedge or bush it affords the fowls a shady patch in summer and some protection from strong winds, both of which are appreciated. But it has so many disadvantages that I discarded it long ago and prefer to have the house on the edge of the run. This is more convenient for the attendant, not only when the house has to be cleaned or the litter changed, but in enabling him to collect the eggs and also to feed and water the stock without entering the run and thus damaging the grass. It is particularly beneficial when several runs adjoin each other, because a cinder path can easily be put down along the whole length outside, which obviates the opening and shutting of gates, sometimes a tedious undertaking.

Providing Adequate Shelter

Shelter never comes amiss in poultry runs, and it is especially beneficial in exposed places; hence in the absence of natural protection a substitute could be contrived, and the best is that which will diffuse the air current in the same manner as a good hedge. For this purpose there is nothing better than wattle hurdles made of split hazel. A single row running from east to west might suffice, although in very exposed runs a hurdle could be placed at each end at right angles and from north to south, or half a dozen placed like a broad V.

These hurdles will provide an excellent wind break; and I have often used them along with colony houses and night arks, in summer as well as winter, not only for breeding stock but for chickens and layers. They are fixed on the slant rather than upright, and secured to stout stakes at each end to prevent their being blown down in a gale. Admittedly, some birds will perch on the ridges of them in fine weather; they have a habit of roosting on anything which provides them with foothold. Therefore when wattle hurdles are in use as wind breaks, place them well away from the fences, otherwise they might enable the fowls to break bounds.

Fencing the Runs

When fowls are being bred from, more particularly when single pens are put together than when flock mating is in vogue, each breeding pen—consisting of one male bird and a specified number of females—should have an enclosure of such a nature that it prevents their having any outside attraction as far as their own species is concerned. In making this

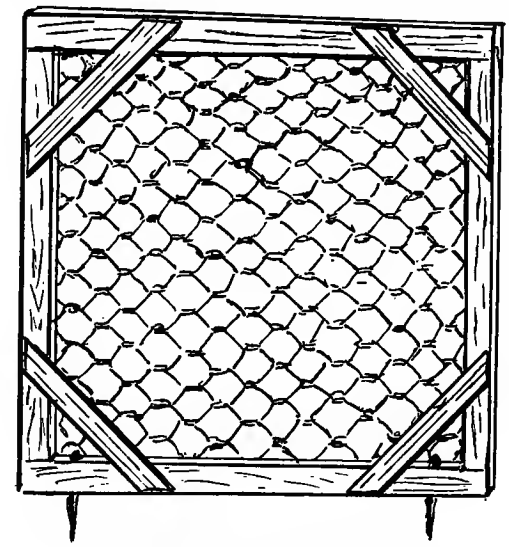


FIG. 18. A USEFUL FRAME

A 3-ft. square frame of 1 in. by 1 in. strips, corner braced as shown, fitted with wire-netting, and covered by a piece of sacking, makes a useful shade from the sun when a wattle hurdle is not available. Two meat skewers (metal) driven through the bottom will make it secure when in use

statement I do so without the slightest belief in the theory so prevalent twenty or thirty years ago, and occasionally propounded of more recent times, that sight has any influence on breeding, that, for instance, the fact of black fowls being kept in an adjoining enclosure to white birds during the breeding season will result in the former producing white or partly white chickens, and vice versa. In my opinion, backed by practical experience and more than one experiment, the thesis is a purely speculative one; and Mendelism as it affects poultry was little understood in those days.

I suggest the segregation of each breeding pen simply as an excellent means of preventing any bird from attempting to leave the enclosure, and to ensure that the male shall not waste his time and energy in trying conclusions with those in adjoining runs. My experience is that fowls do not prove to be good breeders if they are discontented with their surroundings; they are never happy when, for instance, they can see others at liberty. Neither will a male bird, especially a vigorous young cock, attend properly to his own mating if he can challenge another of his

own sex or takes a fancy to a hen out of his reach. For these reasons, therefore, when it becomes necessary to mate single pens, whether they are placed as distinct units on a large range or on a special section in rows alongside each other, the birds forming them should be so fenced that they will settle down to the runs allocated to them.

This necessitates making the lowest 2 ft. to 3 ft. of the wire-netting fence solid all round; and for this purpose it is advisable to use rough boards, galvanized iron sheets, or painted canvas similar to that which is laced around the fences for the protection of stock pheasants in the home pens. When putting up temporary runs I have at times made these barriers of roofing felt or meal sacks, stretching these materials on light wooden frames. They have the advantage of being cheap; but while they are decidedly handy for sheltered places, they do not remain intact for any length of time if they are exposed to winds.

For permanent runs I certainly prefer rough half-inch boards or galvanized sheets, because, as they alone can form the fence at the bottom, they enable one to effect a considerable saving of wire-netting. The only possible objection that can be taken to them is that they are apt to create a head draught if used by the fowls as shelter, because the wind as it strikes the obstruction tends to drive over and downwards with a sweeping motion upon the birds crouching behind.

Fixing Wire-netting

The wire-netting must be fixed to stout wooden stakes, the corner posts being particularly heavy to stand the strain put upon them; and they should be sunk at least 2 ft. in the ground to ensure their being rigid, while the lowest 3 ft. of each post or stake should be charred and tarred, or coated with a mixture of hot tar and pitch to preserve them. The stakes should be fixed 15 ft. to 20 ft. apart, the hole being made by a crowbar, the uprights gently tapped down with a mallet, and the ground well rammed around. The holes for all the corner posts, however, 3 ft. to 4 ft. deep, must be dug out and the spaces filled with earth and stones, which also must be thoroughly rammed down. These posts, as well as the gate posts, will probably require strutting to prevent their being bent by the pull of the wire. The height of the fence will depend upon the breed of fowl which is being confined; but, generally, 6 ft. will be sufficient, except perhaps for some of the light or non-sitting breeds which can fly almost like pheasants. In such a case. though, they should be wing-clipped, that is, the

FIG. 19. FENCING THE RUNS FOR BREEDING STOCK

It will be seen that the height of the divisions (boards) is sufficient to prevent the inmates of adjoining runs fighting with each other. The fowls in the foreground are White Wyandottes—flock mated—and the others, a pen of Rhode Island Reds

longest or flight feathers of one wing, not both wings, cut off with scissors to within about two inches of the skin, which, as already indicated, causes no pain or inconvenience to the bird.

If the fence has to consist of wire-netting only, when, for instance, the screen at the bottom is made of painted canvas, it is preferable to use two lengths of 3 ft. netting than to make it up of one length of 6 ft. netting; and to use a heavy gauge, say 17 or 18, as it wears much better than 19. At any rate, having erected many fences of this nature, I find it much more convenient to handle 3 ft. than 6 ft. rolls, even though by doing so both cost and labour are somewhat increased. In addition to this, the netting can generally be kept taut in such a way, the two lengths being wired together, or bound by means of a 3-in. nail in the following manner—

Pass the nail between the bottom wire of the top length and the top wire of the bottom netting, turn the nail twice round and withdraw it, when both lengths will be firmly fixed at that point. Repeat at every third or fourth mesh. Fifty yards of netting can be joined by this method in a very short time. When fencing the runs which are used for layers only, for hens or pullets kept without male birds, I use 3-ft. high wire-netting at the bottom, and fix single strand galvanized wire at intervals of 4 in. to 6 in. up the

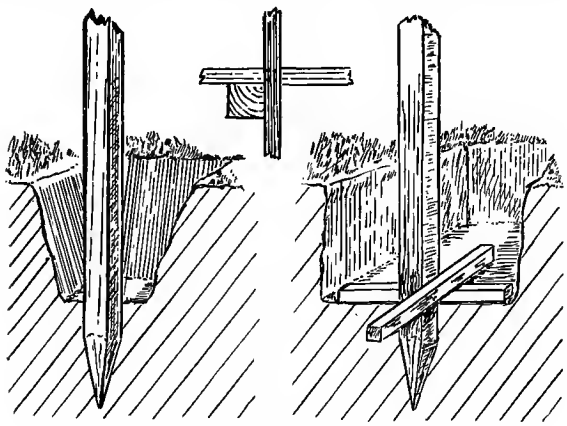


FIG. 20. FENCING THE RUNS

It is essential, when erecting the wire-netting fencing, that the corner posts be fixed rigidly into the ground. A 2 ft. deep trench should be made for each, and a crowbar used for another 1 ft., so that the post can be driven that distance down with a mallet. The trench should be filled with brick rubble, stones, and earth, and rammed well down. If fitted with crosspieces—as shown on the right, and the section in the centre—the post will be rigid even in soft ground

remainder of the stakes. It makes a most effective and cheap fence for fowls of the general-purpose breeds.

To put up a 6-ft. wire-netting fence may appear a very simple matter; but to make it so rigid that it will not be blown down in a gale requires more than a little care. Having sunk the posts and corner posts securely into the ground, drive a 2-in. nail half-way in about 1 in. from the top of each upright. Then unroll the wire-netting on a flat surface to find the "selvedge" of it—the hollow or short edge of the roll—because it must be at the top, to allow plenty

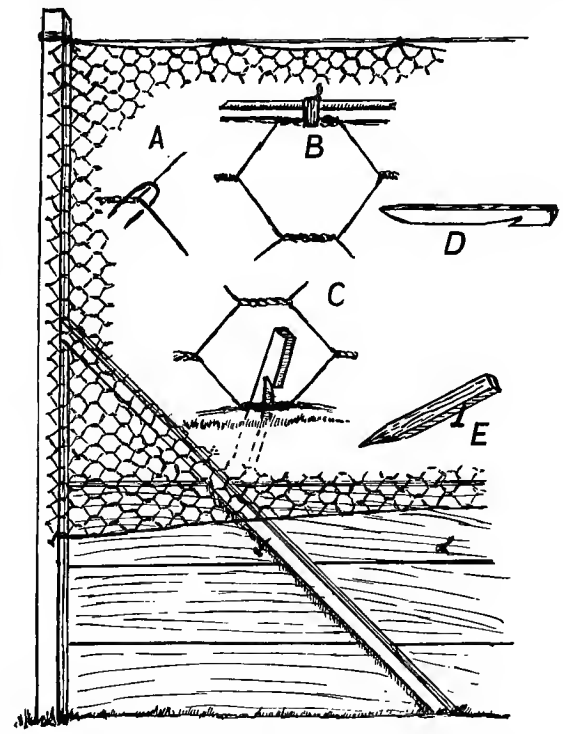


FIG. 21. ERECTING A WIRE-NETTING FENCE WITH BOARD DIVISION

A. Staple *each* mesh to the corner post
B. Secure the netting to the top runner with wire, every 4 ft. to 6 ft.
C. Peg the netting to the ground—the peg being on the slant—when boards are not used
D. 12 in. birch peg, $\frac{3}{4}$ in. by $\frac{1}{2}$ in.
E. 12 in. deal peg, 1 in. by 1 in., with $1\frac{1}{2}$ in. round wire nail driven in, on the slant, 2 in. from the top.
The bottom of the netting should be secured to the top board (by nails) at 3 ft. to 4 ft. intervals

of play at the bottom. Hook the selvedge over the nail on the first post, bend the nail up with a hammer and drive its head into the post. Then proceed to the next corner post, unrolling the netting, and with a lever in the form of a wire stretcher, strain the netting as tightly as possible and secure it on the nail, which must then be hammered up. Return to the first post, fix the netting firmly to it by stapling each mesh in its set form—be careful not to pull the netting out of shape—then loop the selvedge over the nails at the tops of the intervening stakes, and bend up the heads.

This is all that need be done for the time being, except that the whole 50 yards of the wire-netting must be unrolled and secured if such a length is

required for the top of the fence. In any case, I find it best to finish the top in this way before proceeding to fix the netting to the lower part, of course presuming the 6 ft. fence is to be made of wire-netting only and not of wood or galvanized sheets at the bottom. In

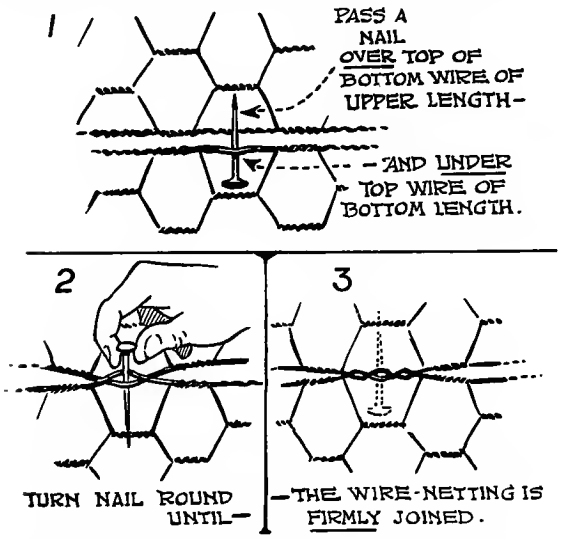


FIG. 22. JOINING WIRE-NETTING FOR FENCING

this latter case 4ft. high wire-netting will probably be required, and it will have to be secured to the screen. This is an easy matter if the screen is made of boards; but when galvanized sheets are used they will have to be nailed to scantling at the top, because it is most difficult for the novice to fit wire-netting on to galvanized iron.

However, if a second 3 ft. roll of netting is required to complete the fence, proceed as with the first roll; but, after squaring the end, and stapling it to the first post, and hooking the selvedge over the nails about half-way up the stakes, wire the two lengths of netting, or bind them by using a nail in the manner already described. Then pull the netting downwards and nail it securely to each post and stake, as low as possible.

To finish the fence, nail or staple the netting to each upright at 2 ft. intervals, and peg the bottom of it—the "play" edge—into the ground, driving the pegs in obliquely at 2 ft. to 3 ft. intervals. It may sometimes be necessary to bury the bottom of the netting as a means of preventing four-footed animals getting into the run; but they can be kept in check by other and less troublesome means. The pegs must be made of hard wood, pointed, and about 12 in. long; and a coat of creosote will do much to preserve them. Catch the netting in the mesh, on the treble strand, and drive the pegs in with a wooden mallet, taking care to hit them squarely on their heads.

Gates and Fences

The gate forms part of the fencing, and it is an important part, too. At least, I always have thought so, and I insist on having it well made and securely hung. When possible the gate might be hung by two hinges on the fowl house for extra security; but in any case fix it where it will not cause the attendant unduly to trample the run, because the land that is set aside for the birds should be left entirely to them, However, the gate should be hinged on the right and hung to open inwards, so that should the birds crowd around when the attendant appears—which is their custom—there is less likelihood of any of them escaping. It is as well, also, to let it swing clear of its frame at the top and sides, and, of course, clear of the ground. My gates are about 7 ft. high and at least 3 ft. wide, to enable me to walk through with a barrow, if necessary. The catch is a simple affair, made of stout wire, so bent that it can be manipulated from the outside and the inside; and it is an easy matter to fix the catch on the post.

The fences and gates with which I have dealt in the preceding paragraphs are suggested, of course, as the best to erect for enclosing permanent runs, and of small rather than very large extent. For instance, a 10-acre field set aside solely for poultry would probably be fenced with wire-netting fixed to iron stakes and corner posts, and it might require two or three lines of barbed wire running through the fencing for extra protection. Moreover, at least one gate would have to

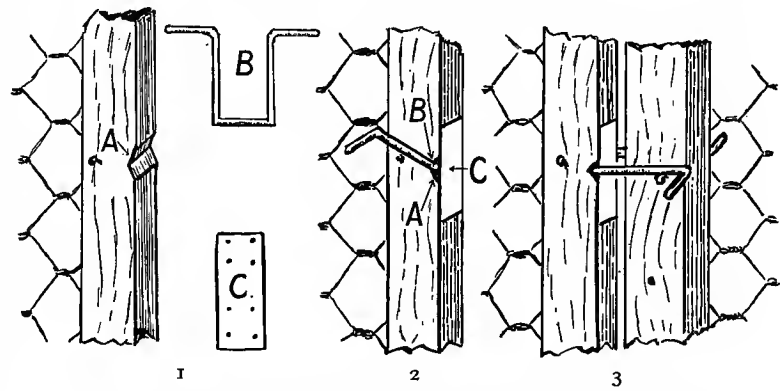


FIG. 23. A SIMPLE GATE CATCH, WHICH CAN BE OPERATED INSIDE OR OUTSIDE THE RUN

(1) *A*. Shallow groove cut across gate-post; *B*. Stout wire bent as shown; the bottom corners must be square; *C*. Plate (tin) fixed on gate-post to keep the catch in place
(2) The catch turned back to enable the gate to be opened
(3) The catch in place when the gate is shut

be wide enough to permit of a horse and cart, a motor lorry, or some such conveyance being driven through.

For temporary runs, however, such as those formed to confine fowls on the semi-intensive system to orchard, garden, allotment, or small holding for a few months at a time only rather than continuously throughout the year, wire-netting hurdles will be found serviceable. They could be made about 6 ft. long and 4 ft. to 6 ft. high, with the posts 2 ft. longer to go into the ground, and should be of light enough weight to be carried about easily; they can be readily put up by means of a crowbar, and braced together with wire or rope. On the other hand, temporary runs can be constructed of 4-ft. wire-netting and chestnut or hazel stakes, without gates; that is, access can be gained to the runs by placing one movable stake loosely in the ground next to a fixed stake and attached to it at the top by a stout wire ring, which can be slipped over at will, entrance being obtained between the two stakes by removing the ring.

Care of the Land

The majority of people who take up poultry-keeping

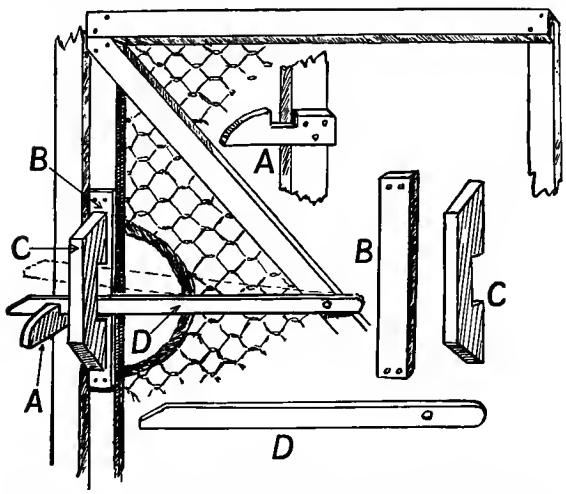


FIG. 24. A USEFUL LATCH FOR A POULTRY-PEN GATE, WHICH CAN BE OPENED AND FASTENED FROM EITHER SIDE BY INSERTING A COUPLE OF FINGERS THROUGH THE SEMICIRCLE CUT OUT OF THE NETTING, WHICH IS BOUND ON TO ROPE

The latch is made in four pieces—
A. 6 in. long, 2 in. wide by 1 in. thick, cut out of hardwood, oak for preference, and fixed on left-hand gate-post
B. 12 in. long, to act as a backplate for *C*, 10 in. long. *B* should be as wide as the frame and as thick as the cross support of the gate
C. Should be screwed on to *B* (sunk heads) and the combination fixed on the gate
D. Is then put into position and fixed with one screw. Screw all parts down in preference to nailing them

on a large scale prefer grassland to any other, although of recent times much has been said in favour of running poultry on arable land during part of the year. Since, however, this latter method can be used on an arable farm only, or where such fields are available, and is seldom possible for the man who rents land solely for his fowls, grass is almost invariably chosen. It may be, as was recently stated, that very

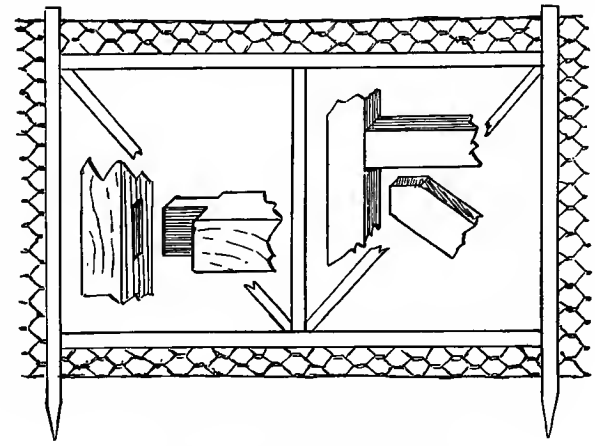


FIG. 25. A HANDY HURDLE

A useful size is 6 ft. long by 5 ft. high. The wire-netting with which it is covered should be left loose for about 6 in. all round. The bottom can then be pegged down, if necessary, while the side-pieces will prevent any gaps when several of these hurdles are used to form a temporary enclosure. In this latter case a stout stake should be used every 12 ft. to 18 ft. to give extra support to the fence

little precise information concerning the effect of poultry on grass or the effect of grass on poultry is available; but the fact remains that, whenever it is possible to do so, grassland is selected in preference to any other. And for a very good reason, namely, that at all seasons we endeavour to provide our fowls with green food in its natural "live" state, because it contains the vitamins so essential for their health. Grassland, therefore, affords an excellent means whereby they can obtain it, except, admittedly, during a particularly dry year or when the land is covered with snow.

I have not the least doubt that the subject will be thoroughly investigated by scientists, and in due course the results made known to the world. We shall then have complete information concerning the best turf on which poultry should be kept. Until then, nevertheless, we shall have to make the most of what grassland is available, always endeavouring to keep it in good condition, because much can be accomplished by sound management. An old friend of mine, a well-known authority on poultry diseases and among the first to perform post-mortem examinations of the humble fowl, once declared to me that 50 per cent of the complaints from which fowls suffer were traceable to impure or tainted ground. This may appear to be somewhat of an exaggeration; but there is no doubt at all that "fowl-sick" soil is the basis of much trouble. And yet there is no justification for tainted land, even when the birds must be confined continually to runs of limited areas.

Already in this chapter I have given the reader some idea of the amount of land that should be allowed in varying circumstances. Let me impress upon him the importance of considering those measurements, in each case, as the absolute minimum. Hence, whenever it is possible to do so, exceed them. In any event, however, choose for preference soil which is dry, exposed to the sun, and permeable, light and naturally

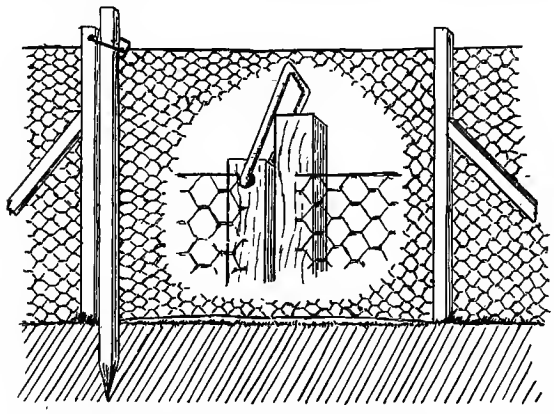


FIG. 26. A LOOSE WIRE-NETTING GATE
A hole, 1 ft. deep, is made with a crowbar to act as a socket for the left post, which is fastened at the top by a piece of stout wire. The netting is stapled securely to the right-hand (fixed) post and also to the left-hand (movable) post

well drained. I should never select heavy clay land, even if the fowls could have absolutely free range, although it may possess certain advantages in the way of vegetation. It may possibly prove serviceable during a normal English summer, but I think I would rather give up the idea of keeping poultry than attempt to run young stock on it for winter egg production. I make this statement knowing full well that large laying houses do provide the birds with a dry place in which they can exercise.

So far nothing has been found to excel grassland that is well drained; but when restricted runs are laid in grass it is absolutely essential that the herbage be kept short. Otherwise the rain does not carry the manure into the soil; it remains in a poisonous state among the long coarse grass. For this reason, that is, to avoid tainted ground, a method adopted by some poultry-keepers whose space is restricted is to divide the land into two runs for each flock, each section being used alternately. But, while this goes far to avoid the danger of overcrowding, it does not necessarily ensure taint-free soil. The grass must be kept short. Small plots can be regularly and frequently mowed, but it is out of the question when an extensive range is in use. When I had the opportunity of doing so I allowed a neighbour's sheep to graze part of the poultry land. I have also turned Chinese geese on to grass runs which may have got somewhat out of hand; but these birds are not suitable for long confinement in small pens, because when they can no longer graze they destroy the turf. A fortnight is the longest time I keep them to clear special patches.

I find goats ideal animals for the purpose, and particularly as they are suitable to run with poultry in the sense that they can both graze the same land without making it unfit for the occupation of each other. Of course, goats are browsers rather than grazers, and they graze only when they are forced to do so, much preferring such shrubs and plants as brambles, gorse, broom, docks, thistles, and nettles. They certainly require constant change of position if they are to thrive on grassland; but keeping them for a few days in the pens gives them a change they appreciate and ensures short turf for the fowls. When so employed each goat must be tethered with a very strong chain on a swivel pin, and in such a way that she—do not try a billy for the purpose—cannot come into contact with the poultry house or fence or any of the appliances. Otherwise she will soon tear up the wire-netting and do other damage. I know from experience how valuable goats' milk is for the rearing of young stock and for putting in the mash when fattening fowls and ducks. Hence, for poultry-farmers who do not mind the little extra work entailed,

FIG. 27. GOATS ON THE POULTRY FARM
"Budge" and "Toddie," aged five weeks. Goats are hardy animals, easily reared, and of great service in grass runs to keep the herbage short

I strongly recommend goats as an excellent means of keeping down grass in the chicken and stock runs.

Cleansing Foul Runs

If for some unforeseen reason, but more likely than not through careless management, the grass appears to be worn down and tainted, the plot should be entirely vacated so that it can be dressed and then

freshened. It may simply want harrowing and dressing with powdered gas lime (about 1 lb. to the square yard) or phosphates and potash. Should the land be very foul, however, and the grass almost demolished from overstocking—a somewhat common fault even among poultry-farmers—it could be heavily dressed with best chalk or limestone lime, and then brought into condition.

On the other hand, large grass runs could be systematically treated once in two years with basic slag, which is an excellent manure for poultry runs because it supplies both phosphates and lime, and has a purifying and sweetening effect on the soil, as well as a fertilizing effect. It acts well in conjunction with the poultry manure, and tends to produce a good sward of clover and fine grasses, which is what poultry require. Further, it has the effect of increasing the lime and phosphate contents of the grass, which are also beneficial to poultry. The usual dressing of basic slag is 10 cwt. per acre of a 30 per cent or higher grade slag, or 12½ cwt. and even 15 cwt. per acre of the lower grades. These latter are preferable because the larger dressing provides more lime, which is an advantage.

The prevailing opinion seems to be that light sandy gravel is the most suitable land for poultry. Admittedly such soil is very sound and dry, but as a rule there is absence of vegetation in summer and comparative absence of animal life all through the year. If one has the choice of land, then preference should be given to well-drained and moderately stout loam, containing, as it does, much that is desirable for egg production. Climate and position are perhaps not so important now that the use of the modern laying house is so well understood; but they also should be studied. For instance, it would scarcely be wise to attempt keeping a large flock of fowls on a site known to be cold and wet. Some breeds can be kept in cold and dry districts, while most will thrive in warm and moist situations. It is generally believed that a very dry atmosphere suits poultry; and yet I have seldom found that chickens which are reared during very hot summers have turned out satisfactorily, although, in the south of England at any rate, they grow particularly well during damp and warm summers. The position of the land relatively to hills, woods, or similar shelter should also be taken into consideration. Those who live in hilly districts, or where wood and bare land alternate, know well the extraordinary difference of temperature that exists between places only a few hundred yards apart.

However, although it has been said that the ideal turf for poultry runs is rarely to be found in ordinary pastures, very few poultry-farmers would consider it worth while to prepare grassland specially for the purpose. The vast majority have to make the most of what is available, for few can pick and choose. A very important point is to keep the grass short, not to let it run to seed, and also to stock the land in such a way that it shall never be overdone with poultry, never overstocked and sickened.

CHAPTER III

HOUSING THE STOCK

SUFFICIENT has been said in the preceding chapter to guide the novice in selecting land on which to keep fowls, while I have indicated how the site he chooses should be stocked to attain the best results. In this matter, as indeed in most subjects connected with poultry-keeping, success depends almost entirely upon keen observation and practical application. In a book the author can but suggest how things should be done, or describe how they are actually being accomplished by experienced men and women; the doing of them must be left entirely in the reader's own hands. As I have already remarked, success will result when common sense and business acumen are brought to bear on the keeping of poultry; it depends more on care and attention to detail than on genius.

To revert for the moment to the question of accommodation in so far as it concerns providing the birds with suitable runs, no one with the least common sense would select a swamp for the purpose; and yet, during my travels, I have occasionally seen fowls kept under most insanitary conditions with no better land than a quagmire, and forced to sleep in veritable hovels, poor and mean abodes. This is not the way to ensure good production or healthy stock.

It is acknowledged that our domestic cocks and hens are descended from jungle fowls which inhabit India and south-east Asia generally, where they thrive and breed in woodland areas and roost in the trees, as do pheasants and other game birds in this country. But while similar conditions could be allowed when keeping fowls under domestication in Great Britain—as, indeed, they prevail on one farm to my knowledge—such freedom does not result in the hens producing the quantity of eggs we desire from them. Housing, therefore, plays an important part in the keeping of poultry, because as the stock is accommodated so, to a large extent, will the birds lay: and this is particularly the case with pullets throughout the winter months. Fowls must be adequately housed, while in the housing of laying stock the breed as well as the locality should be studied.

There are, as I have said, several systems under which poultry can be ranged; hence it must be evident to the veriest tyro that there is no one type of house which will do for all conditions. As it is, there is more than one kind suitable for each system, which can be ascertained by perusing catalogues issued by manufacturers who specialize in appliances. In this matter the prospective poultry-keeper should experience no great difficulty in making a selection, because of a truth there are designs to suit the most exacting demand. It may be a problem with the beginner whether to purchase or to build the houses he requires. I must say that most of the models now on the market are sent out in sections so carefully made and numbered that all the purchaser has to do to prepare a house for the birds is to put in a few bolts and nuts or screws, fix the perches and nest boxes, and secure the windows. Generally, too, so much are the planing, cutting, etc., of wood done by machinery these days, that a small house can be delivered to one's door at a cost not very much in excess of the price which the beginner would have to pay for the raw materials. It certainly tempts one to buy the house ready-made rather than attempt the building of it.

However, to many people there is a great amount of satisfaction in making one's own fowl houses, while it must be admitted that the ability to do so is a considerable asset when funds are short, because economies are effected when labour costs are not counted in. Consequently, if the beginner in poultry-keeping has the necessary tools and can properly handle them, let him proceed to make all the houses he requires, because I know from practical experience that it results in a big saving if the builder has not to draw a carpenter's wages while engaged on the work.

Of course, many things have to be mastered to enable him to turn out a good job. It means that he must know how to handle saws, planes, chisels, bradawls, gimlets, screwdrivers, hammers, brace and bits, squares, and marking gauges, and even know how to drive a cut nail home without splitting the wood, while if he aims at setting up a big place he must also be able to cut joints to the exact degree. So, I strongly advise him if lacking expert knowledge to consult a poultry appliance maker of repute and purchase a ready-to-fix house, because he will find it cheaper in the end.

To go into details concerning the actual building of a house is not within the scope of this book. The most I can do is to offer a few suggestions which should prove serviceable, and to describe briefly the types which have been found suitable for different methods of keeping poultry, because there are so many models on the market that it may not always be easy for the beginner to select one to suit him. In this matter, however, he must be guided to a great

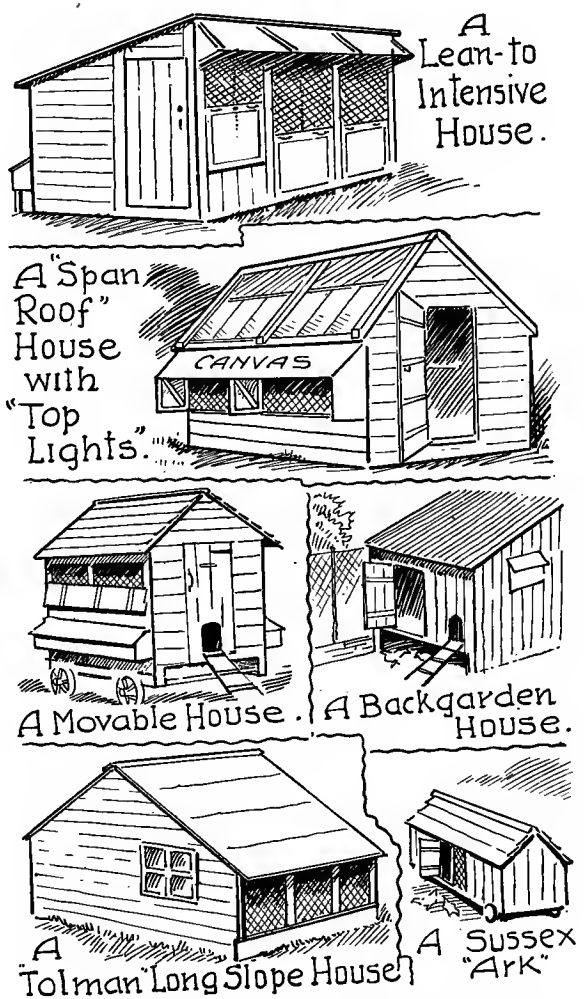


FIG. 28. USEFUL TYPES OF FOWL HOUSES

The hood (or weather-board) of the "Lean-to" is made of glass, as are the up-and-down windows

The canvas hood and wings of the "Span Roof" are waterproofed; and, although they are closed during winter, the windows in the roof provide ample light for the interior

The "Movable"—a field house—has a wooden floor, thus ensuring a shady spot when necessary

The "Back-garden" model is similarly fitted, the space underneath acting as the scratching shed. It is a type of house frequently met with in gardens, but I prefer the lean-to

As can be seen, three of these types make very suitable intensive houses

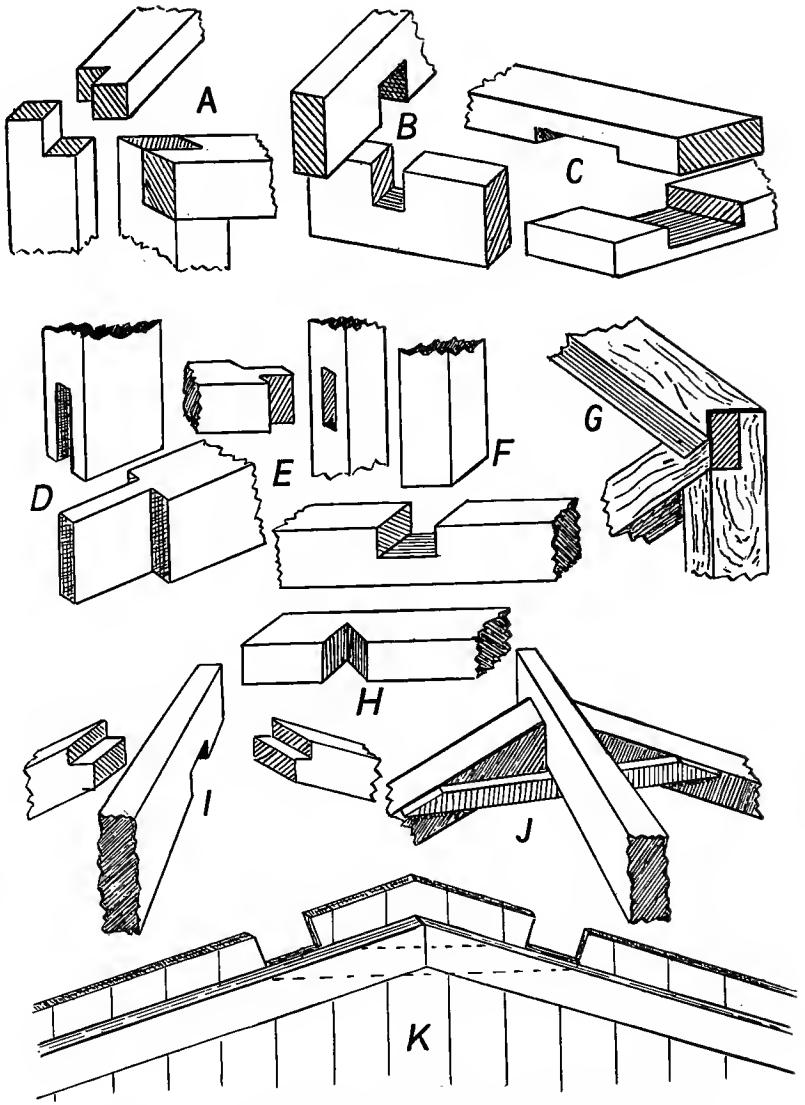


FIG. 29. JOINTS USED IN THE MAKING OF POULTRY HOUSES

A. The half-and-half or halving joint (corner)
B. The cross-halving
C. The flat-halving
D. The angle bridle
E. Tenon and mortise
F. A housing joint—used in fixing-in partitions securely
G. How the roof rafters should be fitted
H. How some roof rafters are cut. A faulty joint, very liable to cause the end to snap off
I, J. Rafter and ridge joints for a gable roof
K. A common method of joining end rafters, when ridge ventilation is used. The rafters are simply sawn to angle and nailed, afterwards being secured by an iron plate screwed on, as indicated by the dotted lines

extent by the conditions under which he intends to keep his stock.

Useful Suggestions Concerning Timber

No matter whether the house be fixed or movable, the best timber to use for the walls is selected yellow

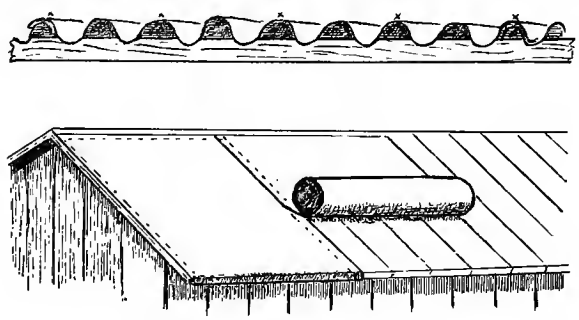


FIG. 30. COVERING THE ROOF

Above. Corrugated iron should be secured by being nailed or screwed through alternate ridges (as indicated by crosses) and the sides allowed a one-bend lap over

Below. Vulcanite felt should be put on from ridge to eaves—not across the roof—and if not secured by special nails and cement then by strips of wood screwed on, as indicated by the dotted lines. The felt should overlap about 2 in. at the sides and be bent over and nailed to the edges of the roof boards

deal, for small buildings not less than $\frac{3}{4}$ in. thick —planed, tongued and grooved V-jointed matching finishing $\frac{5}{8}$ in.—and for houses which have to be periodically moved, or have to stand much exposure, 1 in. thick. For the framework 2 in. × 2 in. quartering is necessary for the main rails, and $1\frac{1}{2}$ in. × 2 in. for intermediate ones. The whole of the timber should be coated with a reliable wood preservative, and the parts which touch the earth scorched and soaked in tar up to at least 1 ft. from the bottom, inside and out. There are two styles of roof, viz. the drag or lean-to, and the span, either with a centre or three-quarter ridge, this latter being known as the hump or hip roof, as it has the ridge about one-third across and with a long pitch to the back or front.

The style of roof to adopt depends upon the situation of the house. For instance, the drag answers for a well-sheltered place, the centre span for a large house having greater length than depth, and the hip for the reverse. The lean-to roof, sloping downwards from front to back, ensures the maximum of light, if the house face south, while the span equalizes light and heat. The former, almost invariably open-fronted or at any rate with the top half of the front made of wire-netting and the roof projecting over it to act as a shade, is, however, so easily blown over in a high wind that it should not be set up on an exposed site; and its only place is an orchard or garden. I once tried such a house for field work, placing it against a hedge, but it got shaken about and the birds refused to roost in it after two or three nights. Fowls certainly prefer to have their night quarters away from hedges, much as they like to shelter in a hedgerow and exercise there during the day.

Timber is in general use for the roof of poultry houses, and it must be bolted to the framework. Roofs are almost invariably covered with vulcanite felt, which is more secure when put on downwards, from ridge to eaves, than when laid across from end to end of the roof. If, however, the roof is of timber only, it must be tarred annually, or, when once tarred it can be dressed with a mixture made in the proportions of 2 lb. of lime and 1 lb. of pitch in half a gallon of tar, all boiled together in the open air and applied when hot. Corrugated iron sheets make a sound roof; but unless they are pierced upwards (by a special process) they should be put over rough wood and felting. Where it is possible to do so, fit guttering so that the rain—from plain and not tarred roofs—can be caught in barrels or tanks.

The attendant's door can be fitted with tee hinges

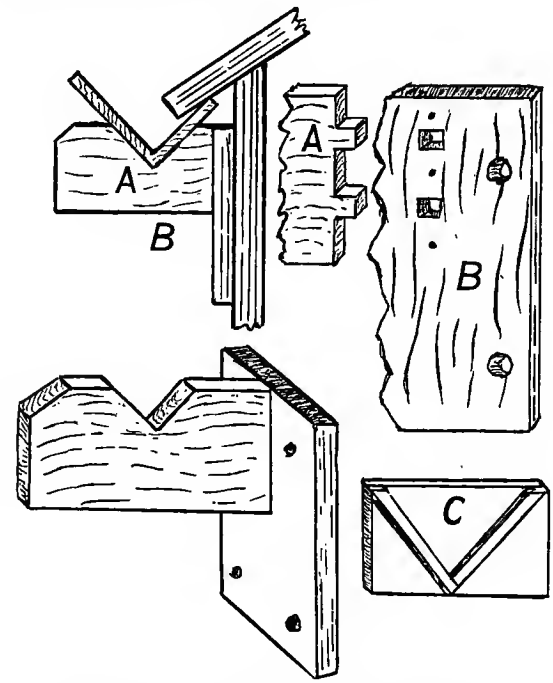


FIG. 31. A SIMPLE TYPE OF GUTTERING

This is made of wood to a half-oblong or half-square type, and supported by brackets. The support (*A*) should be jointed into the back plate (*B*) and screwed on, the plate then being secured to the house. The ends should be blocked by means of a plate of wood (C). A fall of 1 in. every 8 ft. should be allowed, with a down pipe fixed at the lowest point, or for a long roof, pipes at convenient distances

and be made to open outwards against the house and not on an edge of it, while if the house is a large one the door should be fitted with runners, to slide. If the former method is adopted there must be sound inside flanges to obviate draught. This can be

supplemented by a wire-netting door to fit into slots and be caught at the top and bottom with wooden "buttons," so as to permit of a thorough airing of the interior in hot weather.

First Principles

Sunlight and fresh air are essential for the successful keeping of fowls; hence the house should not have a dark corner. Let sunlight be admitted to every possible part. If the building is a large one, windows should be fitted in the front and the back, about 1 ft. from the floor, and be made to swing upwards or lift out. There should also be top windows in the front,

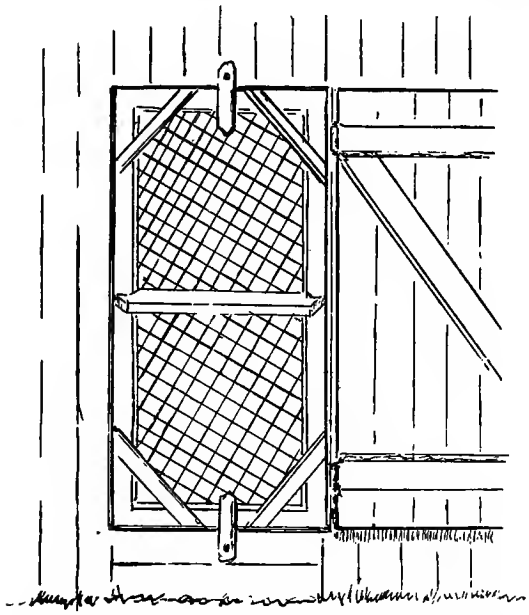


FIG. 32. A TEMPORARY WIRE-NETTING DOOR
When it is not convenient to hinge the wire-netting door—for use during summer—it can be secured against the flanges by means of wooden buttons

either to slide up and down, hinged at the top to open outwards or at the bottom to open inwards; but in all cases the apertures must be covered with small mesh wire-netting. This is especially important when the house is being used by pullets for the first time as their winter quarters. Until they get accustomed to it the birds, which are apt to be nervous when coming into lay, sometimes attempt to fly through the glazed windows. Hence the use of netting to protect them and the glass. At the suggestion of a friend I once tried painting a broad band vertically across each window; but it did not prevent the pullets flying against the glass, as I was assured would be the case.

The top windows could consist of single sheets of stout glass, not in frames, but resting in frames or hoppers, and capable of being opened inwards for 6 in. to 1 ft. These are ventilator windows which I term "Lancashire lights," because it was in that county I first saw them in use many years ago. Small houses

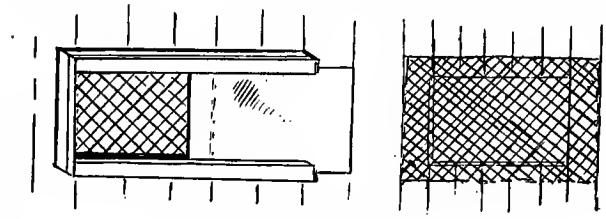


FIG. 33. FLOOR "LIGHTS"
A simple type made of a sheet of glass, which can be slid along. Wire-netting should he fixed inside the house, as shown on the right

such as arks might well have a roof light, since it is seldom possible, or desirable, to fit them with front or back windows.

As regards ventilation, the idea is to provide fresh air without draughts. Something more than a few

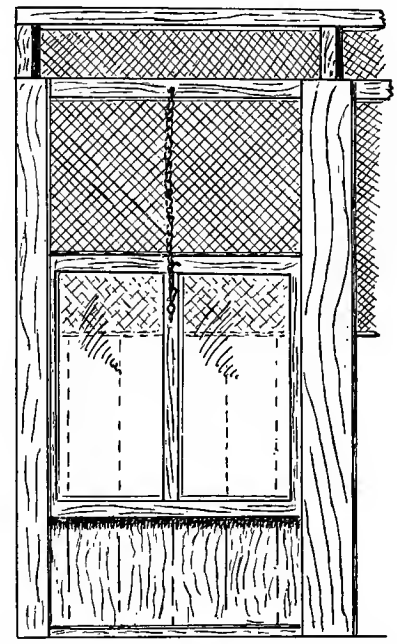


FIG. 34. AN "UP-AND-DOWN" WINDOW
Windows similar to the above are almost invariably used for a house of the lean-to type which has a half-open froat and is fitted with a weather board. A space of at least 6 in.—and covered with wire-netting—is left at the top, so that the front is never entirely closed even when all the windows are up

holes at the highest parts of the end is required. Avoid a draught over the birds while they are perching; and prevent wind entering the house to such an extent that it will ruffle their feathers. The actual method of ventilation depends upon the style of house in use; but, generally, eaves ventilation at the back should not be tolerated, particularly if the fowls have

to perch there. One large house I purchased was so ventilated, but as the lower roof beam was within a few inches of it, the air was forced on to the birds' heads, causing some of them to catch cold before I observed the fault and filled the space. I have experimented considerably in the ventilation of fowl houses, but I have yet to find a better method than the ventilator type of top window with an outlet along the whole of the ridge, the peak of the span house.

The trap-door by which fowls leave and enter their house should be at least 1 ft. wide and 1 ft. 6 in. high and fitted with a sliding rather than a hinged shutter. I keep these traps closed when the fowls have gone

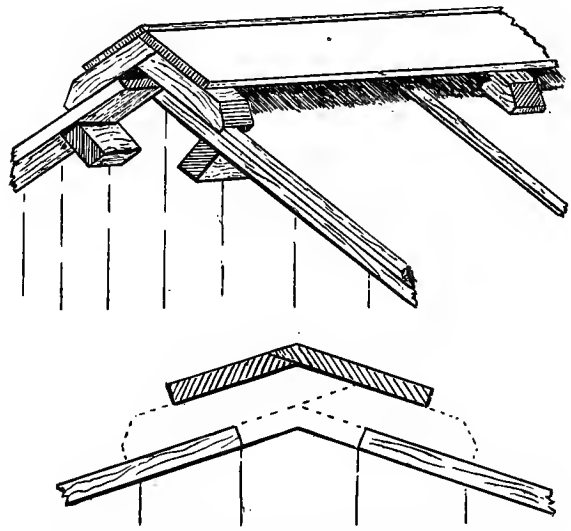


FIG. 35. A RIDGE VENTILATOR

In the section depicted, the dotted lines represent the blocks which are required to ensure the open space. They are cut from 1½ in. square timber, and each block is 9 in. long. The ridge and roof boards are ¾ in. thick, the former being 6 in. wide. The open space at each end of the roof is about 2 in. across. In some houses there are no open ends

to roost. Houses fitted with front up-and-down windows should have a hood fixed along the whole length of the open part at the top, 1 ft. or more wide and sloping downwards at an angle of about 45 degrees, so that an ordinary driving rain will not enter the house.

Just a few more reminders for those who wish to build their own fowl houses. When screws are used, and coach screws are best for most parts, they should be long enough to grip firmly. They must never be hammered in; give them a start by using a gimlet, then screw them in so that their heads are flush with the surface, not above it. Dip them—screws and bolts also—into tallow or other grease before use, so that, should the occasion arise, they can be readily taken out. Of nails, those known as cuts are the strongest and retain their grip; but if there is any likelihood of the timber having to be removed use wire nails, round or oval, the latter being the better. Ovals and cuts, which are oblong in section, must be so held for hammering that the length (section) is with the

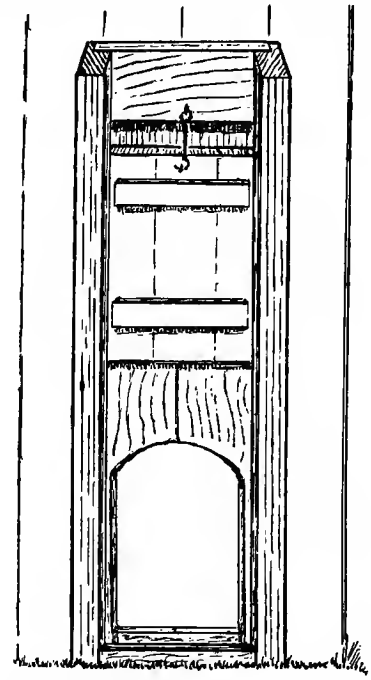


FIG. 36. THE TRAP-DOOR

The trap-door to the fowl house should not be less than 1 ft. wide and 1 ft. 6 in. high. If fitted with a pull-up shutter, as shown, it will prevent draughts when the house is closed

grain of the wood and not across it. A bradawl is useful to obviate splits. The strips of wood necessary to keep the roofing felt in place should be secured with screws, not nails, but the edges of the felt must

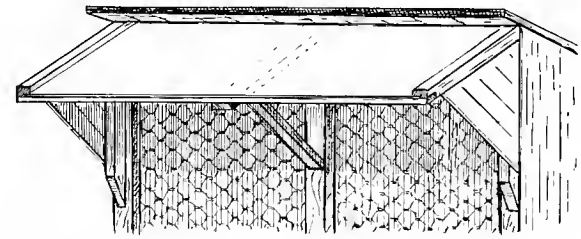


FIG. 37. A WEATHER-BOARD FOR A LEAN-TO HOUSE

This weather-board is topped with glass. The side pieces or wings are made of ⅝ in. boards or three-ply, nailed on to 1 in. by 1½ in. wooden stays, V-shaped, one length of which is screwed to the house, and the other underneath the frame of the weather-board

be held in place with nails made specially for the purpose.

Different Methods Described

Having made these few suggestions for beginners, let me proceed to describe the different methods of

housing which are in vogue. Although it was customary in the old days to provide fowls with some form of lean-to shed as their roosting quarters—and often a dark and stuffy abode with the idea of keeping them snug and warm—it is now recognized that the laying hen requires a healthy place in which to sleep, and one in which she can breathe fresh air in the night. Of course, not all the houses which were used in the days when poultry were first found to be worth cultivating for eggs and meat were fixtures, although some of our more recent poultry specialists appear to imagine they were. Many years ago the Sussex night ark was quite common in the south-eastern counties of England, while in other parts of the country the colony or field house and the "stubble wagon" were met with, and the fold house is by no means a recent discovery for the keeping of fowls. All of these latter were, and are, portable.

During the past twenty years or so, however, vast improvements have been made in the housing of poultry; but while some new systems have been adopted, at least one of the old forms of house has been elaborated and renamed. Generally speaking, the present systems can be grouped under six heads, viz. ark, cabin, colony, fold, laying, and intensive, the last-named including the hen battery.

The Sussex Night Ark

Why this house was so named is probably because it resembled the top part of the vessel in which Noah and his family were preserved during the Deluge. Be that as it may, the Sussex night ark is a small apex-roofed house, originally built for chickens and young stock as a sleeping place, and used in the county of Sussex for the production of table poultry for, it is believed, hundreds of years. It has fairly low sides, a door in the front and another in the roof. Its great feature is the floor, which is made of spars or slats, resting several inches above the bottom of the walls, so as to permit of free circulation of air while the birds are sleeping on the spars. There are no single perches in the ark as in the usual poultry house. The spars are square, 1 in. in diameter, the edges being bevelled

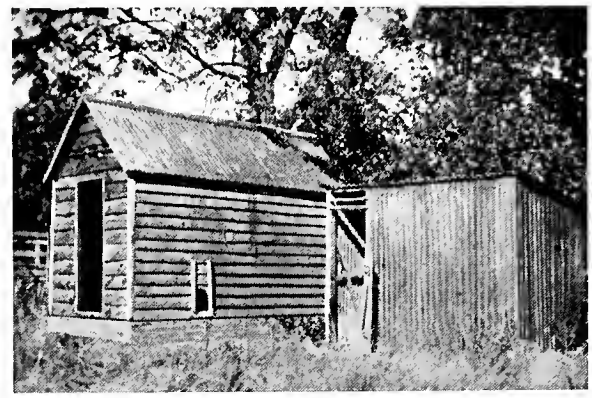


FIG. 38. TWO FARM POULTRY HOUSES

These two houses were used for the poultry for many years on this farm. The one on the left, made of thick oak boards, accommodated the hens, and the other, of corrugated iron sheets, served as laying and night quarters for the ducks. They are located in what was, in former days, the stack yard; and the birds were allowed free range of the fields, yards, stables, and other farm buildings

or the top rounded and the sides narrowed at the bottom; and they are fixed one inch from each other. Therefore, no matter how much the occupants might huddle together while sleeping they would never become over-heated, because the ark having four legs which keep it a few inches clear of the ground all round, air circulates freely beneath the birds.

The Sussex night ark was originated solely as a house for young fowls for market; and for many decades it was used for that purpose alone by chicken rearers in Sussex. Its possibilities as suitable roosting quarters for laying stock had never been considered until Mr. F. G. Paynter, of Hounslow, Middlesex,

FIG. 39. WELL-ARRANGED NIGHT ARKS

How night arks or small slatted floor houses should be arranged when in use for laying stock or growers. Although the birds occupying them as roosting quarters will mix freely during the day-time, since there are no fences, there is seldom any overcrowding at night, each unit returning to its own house for sleeping

conceived the idea of using such accommodation instead of the ordinary box-type poultry houses while he was experimenting during the years 1908–11.

I have before me as I write a detailed account of an egg production experiment made by him for the (then) Board of Agriculture and Fisheries at Morden Hall, Cambridgeshire, during 1914–15. It was the first time that laying birds had been housed in large numbers in this type of house, with no scratching sheds or other means of shelter, except that a certain amount of protection from the wind was afforded by

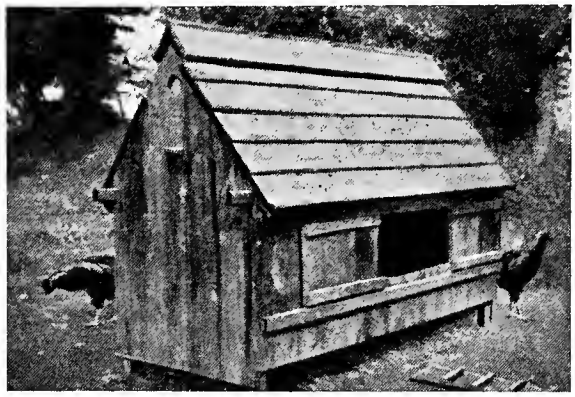


FIG. 40. A SUSSEX NIGHT ARK

This ark, of Mr. Paynter's design, is fully described in the text. I have had it in use for several years, for growers, layers, breeding stock, and table birds. When the photograph was taken it was the night quarters of two dozen Rhode Island Red cockerels which were being "run" fed for market

a hedge. The stock consisted of about 1000 pullets, mostly pure-bred general-purpose and table fowls, but not in any sense promising for egg production, since they were hatched late in spring and had been reared with a view to the production of flesh. However, although the winter and spring of 1914–15 were characterized by heavy and continuous rains and by cold winds, the results indicated that the ark had a wide sphere of usefulness. And it certainly established Mr. Paynter's right to claim to be the pioneer of the slatted floor house for layers.

The Original Type

The type of Sussex night ark I have had in use for several years was made to Mr. Paynter's design and is in most details similar to the original. It is 6 ft. long by 3 ft. deep, 5 ft. high at the ridge and 3 ft. at the eaves. The slats are placed 1 ft. from the bottom of the walls, since by keeping them so high the birds at night, when roosting, are well out of the up draught and removed from the ammonia that arises from their droppings, which are considerable when the house contains its full complement of laying birds. This slatted floor is made in four sections so that they are easily removed for cleaning. A 5-in. space is allowed all the way round the house between the bottom of it and the ground, the four corner posts finishing such a length beyond the walls and acting as legs. But on the ground there is a movable wooden floor made on 1½ in. square battens to keep the birds' droppings from the earth and to facilitate their removal. The roof has a 5-in. wide opening all along the ridge for ventilation, but it is capped by an inverted V-shaped trough its whole length, nailed on four pieces of 1½ in. batten each side, while the sides of the trough overlap the roof opening 3 in. back and front, and the ends are blocked flush. The eaves project 6 in. each side, and under them is a 1-in. space, while there is also a round hole, 3 in. in diameter, in each gable about 6 in. from the peak.

The door in the front wall is made in two parts, which can be slid to each end; they reach from slats to eaves and cover an aperture 3 ft. wide. Each section of it is 1 ft. 8 in. wide and, except for 5 in. of 1 in. mesh wire-netting at one end, is made of wood. During a long spell of rough weather in winter and early spring I tack pieces of light sacking over these small wired parts when young stock is being housed, and I keep them closed at night. These sliding doors enable the ark to be thrown right open as a day shelter or entirely closed for night roosting, according to the weather. The door in the roof of the ark, in front, when lifted off—it is not hinged—exposes an opening less than 2 ft. wide; and I find this is very handy when it becomes necessary to catch any of the inmates. Pieces of glass 9 in. square are fitted along the top of the roof at the back, immediately below the peak, and they increase the light of the interior; in summer they are whitewashed underneath. To prevent chickens getting under the ark I fix 1 in. mesh wire-netting temporarily around the open space at the bottom.

With the numerous openings in this type of ark it might well be imagined that the birds would be subjected to so much draught that they could scarcely be free of colds in winter; yet this is not the case, because troubles of that nature are unknown among my chickens so housed. Such, at any rate is my experience; and I have had as many as fifty young birds roosting comfortably in an ark of the dimensions stated above. It is as well to remark, however, that chickens are not transferred to the ark before they are about eight weeks old, while in the early season the sparred floor is at first covered with straw. Some rearers use sacking for the purpose, but I prefer straw because not only can it be kept reasonably clean but the birds gradually work it through the slats and are thus the quicker accustomed to the air. They reach the floor from the ground by means of a "chicken

ladder," and although it may be strange to them at first they very soon become accustomed to it.

When this type of house is used on a permanent range in a somewhat exposed place I find it beneficial to erect a rough shelter for the birds, although it is not required if they can have hedge, spinney, or orchard as protection from winds. One that I am using is about 8 ft. long by 5 ft. 6 in. deep, 3 ft. high in front and 2 ft. 3 in. at the back, which part and the east end are made of wood, the front and other end being open.

When layers are being housed in the ark—the one mentioned is large enough for two dozen adult birds—a three compartment nest box is put against the west end of the rough shed and another of similar capacity at the back of the house, in each case facing inwards. As a rule, the fowls, whether pullets or seasoned hens, use these nests freely, although occasionally one may take it into her head—for fowls are very foolish creatures sometimes—to lay on the slatted floor. If this latter should happen, however, I keep the ark shut during the morning, no matter what state the weather, because these stray eggs are very apt to get broken and likely to lead to egg-eating. It is best to look on Sussex arks as day and night shelters, hence it is advisable to have the nest boxes separate from the house.

FIG. 41. SUSSEX ARKS FOR LAYERS

How 120 layers were accommodated in eight night arks on a section of Mr. F. G. Paynter's poultry farm at Hounslow. The nest boxes—four sets of them are shown, on legs—and the coops containing dry mash hoppers are seen in the foreground

The Slatted Floor House

As I say, Mr. F. G. Paynter was the pioneer of the slatted floor house for layers; and the "Slatted Floor Poultry House Demonstration, 1930–32," carried out at Warren House Farm, Stanmore, by the Middlesex Agricultural Education Sub-Committee—a final report of which was issued in 1933 by the County Council of Middlesex—was "the logical outcome of previous work by that committee with slatted floor housing in its simplest form, the Sussex night ark, as used successfully for many years" by Mr. Paynter. This previous work, I may say, resulted in the birds which were

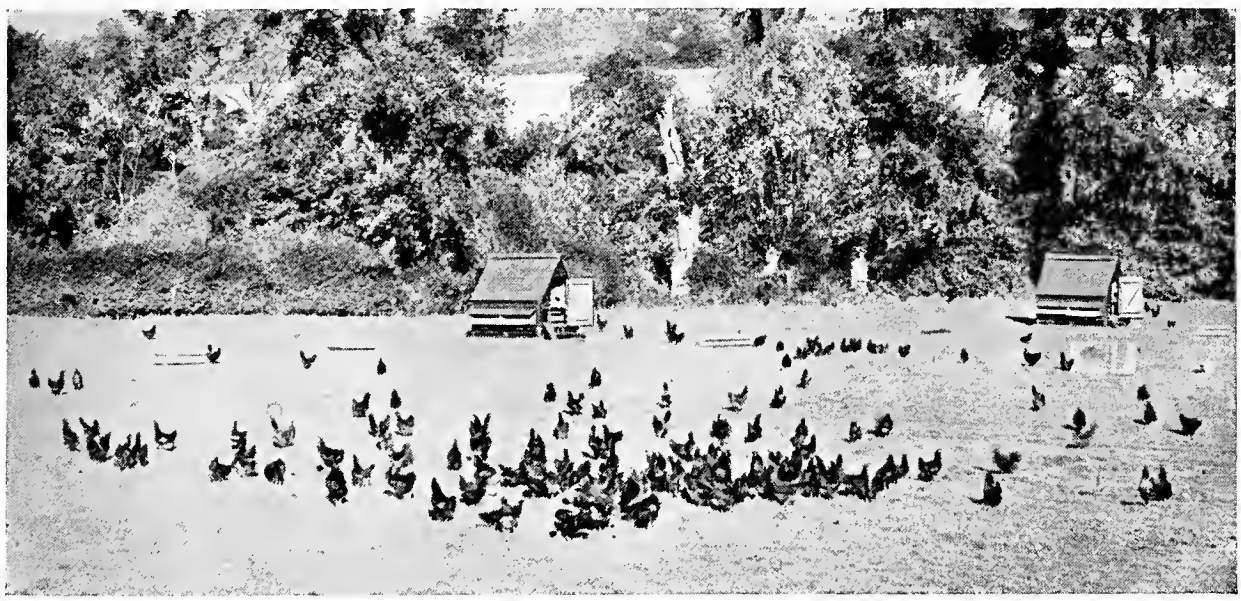


FIG. 42. SLATTED FLOOR HOUSES

These houses, with outside nest boxes, are being used by hens—Rhode Island Reds—on free range

housed in night arks giving a better egg yield than others with ordinary laying house accommodation at the same test.

One of the objects of the 1930-32 demonstration was "to test the efficiency of large slatted floor houses for egg production." Plant was set up to provide for 1000 birds in units of fifty, each with a grass plot of one-fifth of an acre. The stock consisted of first cross pullets, "typical large-unit reared chickens, fairly well grown, apparently healthy, but by no means carefully selected"—to quote from the official report. At the time the demonstration started, the slatted floor housing of laying stock was a comparatively new method; hence a description of the house is given, as it was among the first to be tried for flocks of fifty.

It was of the span roof type, 8 ft. by 7 ft. overall, 7 ft. 3 in. to the ridge, on four 15 in. wheels with 3 in. tyres. The fittings included outside nests on one end, an attendant's door and two hen exits at the other, and inside food and water hoppers running the whole length of each side. The slatted floor, in three sections, was detachable, while there was ventilation at the eaves and ridge, and 6 sq. ft. of glass in the centre of the roof on either side of the ridge. The slatted floor was 2 ft. above ground level, giving 5 ft. 3 in. head room; but the walls were only 2 ft. high inside, which gave the roof a steep pitch. The walls all round were carried 8 in. below the slats, leaving 2 in. clearance for under-ventilation, a feature which was copied from the night ark, and, in view of its proved reliability in respect to ventilation, an important one. The manure tray was of metal, in two sections, placed 10 in. below the slats, i.e. 2 in. below the skirt; and the sections drew out from either end.

The report of this demonstration is necessarily a lengthy one; but from it I gather that although egg production was satisfactory, it was not more so than when the Sussex night ark was used for housing. The slatted floor house being on wheels, the birds did not utilize it during the day for shelter, and, moreover, to handle the stock was not a simple matter during daylight at any rate. To quote from the report regarding this matter: "In this respect the small Sussex night ark is supreme. A section of the roof lifts out and all the occupants are at hand. There is no struggling, no fright and no injuries, whereas in the large houses, even with catching crates at the exits and a length of wire-netting drawn quietly round the birds, which were gently urged to the exits, injuries were frequent." However, despite the undoubted disadvantages, the result of the demonstration carried out in Middlesex was to give a fresh impetus to this form of accommodation, so that slatted floor laying houses have certainly become popular within the last four or five years.

As can be imagined, the system is merely a development of the small ark which has for generations been found so successful for table rearing in Sussex; but although many variations in design are now to be seen capable of accommodating from fifty to two hundred head of laying stock, most of the small ones are simply arks which have been slightly elaborated. No matter what size they are, however, they provide nothing more than sleeping accommodation, with shelter from the weather on rough days, because the birds are forced to live out of doors during the greater part of their lives.

Ridge Ventilation

The principle of ventilation is the same in all models, since, whether large or small, they are open along the bottom and at the peak, while the best have eaves ventilation also. With regard to ventilation at the ridge, this may be a matter which will have to be governed by the climate in which the birds are kept. My experience with the slatted floor type of house—the Sussex night ark that I have already described in detail is so called by some manufacturers and advocated as capable of accommodating up to 100 layers—has been confined to the south of England; but the 5-in. wide opening it possesses has not had to be in any way modified since I moved my poultry from a well-sheltered and somewhat low range in Surrey to a rather exposed and high position in Berkshire. No alteration whatever has been made in that type of house.

On the other hand, a Hampshire advocate of the slatted floor system finds that for an 8 ft. by 3 ft. house an opening of ½ in. to 1 in. is sufficient at the ridge, covered by the usual type of ridge-cap, while a Lancashire poultry-keeper says that for his 7 ft. by 7 ft. house the only other ventilation necessary beyond a 3½-in. air space all round the bottom—between the sides and ends of the house and the manure board—is the outgoing at the ridge. This opening is only ¾ in. wide (right along the top of the roof) with an ordinary ridge-capping covering this hole, the capping being 1 in. off the roof. As to the "cap," it was once suggested to me that a flat 12-in. board fixed 1 in. above the roof opening, instead of the trough-like cover just mentioned, would prevent down draughts and also prevent snow drifting into the house. A slatted floor house embodying that principle was built by one of my sons; but I have yet to be convinced that it is any improvement on the original—which has weathered several snow-storms with no ill effect—while it is, in my opinion, awkward to fix.

It may be a question whether eaves ventilation is required; and yet, since the roof overlaps the walls by 6 in. and the open space is only 1 in., I find such

ventilation by no means detrimental to the birds, whether chickens or adults. As regards the amount of ventilation that should be allowed under the slatted floor, some readers may think it would be a good plan to arrange means for regulating these openings; but this would apply only when chickens were being so housed. Some slatted floor houses are made with hinged flaps for the purpose, because one of the advantages of this type of house is that it can be used by the same birds practically from early chickenhood until old age—if fowls are ever allowed to grow old in years. However, I have not found it necessary to make such additions; while a very large amount of ventilation under the floor may appear to be harmful to young fowls during the early season, straw over the slats, as I have already mentioned in connexion with night arks, is all that is required.

The Value of the Manure Board

In my opinion a manure board on the ground itself is beneficial for use in a slatted house, because not only does it prevent the fowls' droppings poisoning the land—as they would do unless removed daily—but it permits of their being kept in a dry state, which necessitates their clearance not more than twice or thrice a year. The bottom space being open all round, the manure always has a draught across it, no matter from which quarter the wind blows; hence it dries quickly and becomes practically devoid of moisture. I am certainly not in favour of the sliding manure boards on fixed runners which are made on some slatted floor houses, because they have to be cleared weekly, perhaps more frequently than that, which adds most unnecessarily to one's labours.

The ground board (or tray, although I prefer it without rims) is made of 1 in. tongued and grooved wood on two or three 1½ in. battens, the grooves being on the lower side, and the whole well creosoted. It is then an easy matter to tilt the house or lift it off when the manure has to be removed. Even with several months' accumulation the house remains in a sanitary condition, always provided that the slats and the interior are kept clean.

It may not unreasonably be asked why the manure should be allowed to accumulate for several months when the house is made portable so that it can be periodically moved to a fresh site. That, undoubtedly, is one of its strong points; it should be reasonably easy to move and should, therefore, be moved. But, unless the houses are on grassland that is grazed and not set aside solely for poultry, I am afraid they become almost fixtures. In my opinion, however, this is a mistake, because when the house is placed in a single grass run of moderate size the ground becomes fouled much quicker than it would do were a modern laying house in use, on account of the fowls having to spend nearly all their day outside the building. They should therefore be moved.

At one farm on which this system is in vogue, each house accommodates fifty pullets or hens, and a score of these buildings are arranged in one row with only a few feet separating one from the other, the whole occupying the same large wired-in paddock. All the buildings are moved the same day on to a fresh site, every two or three weeks, each move being only a few yards, so that the birds gradually cover the whole of

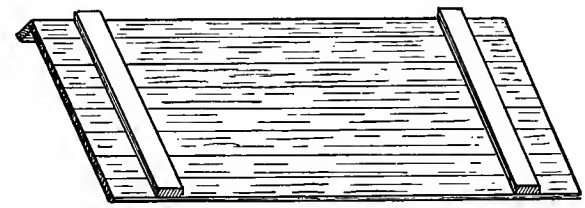


FIG. 43. A DROPPINGS' BOARD (INVERTED)
Showing how the match-boarding should be braced underneath, and the droppings' board fitted with a ledge in front

the ground. By the time the row of houses works back to the original position, it has had some months in which to recover its condition; but only 100 fowls are allowed to the acre.

Cleaning the slats is an important part of the work in connexion with this type of house; they must be cleaned all round, not merely scraped on top. Making the floor in sections enables one to do this work with less trouble than when each slat is movable. I use a stiff brush and hot water with a few drops of a reliable germ killer in it, and this is preferable to scraping, which is apt to roughen the surface of the wood and prevent dirt falling from it. The slats must never be allowed to become caked with filth. Cleaning and disinfecting the inside of the house may cause a little trouble, because of the lowness of the roof; but crevices and corners must be reached, since it is in such places that red mite are apt to hide during the day to annoy the birds while they sleep. However, there need be little fear of such worries if the fowls can get a dust bath. Birds kept on this system of housing do seem to be particularly free of external parasites, because not only are they very hardy by having to range the open but the fresh air within the house does not encourage red mite.

As to the capacity of these houses, the slat space is generally worked out at 1 sq. ft. to every two birds. Those measuring 8 ft. by 3 ft., for instance, will accommodate forty-five to fifty layers, although I have seen only fifty in a 7 ft. by 5 ft. house. The former may appear to be vastly overcrowding, but little more than two-thirds of the floor space will be occupied at night, while if the fowls are not covering sufficient of the floor the house will be too cold in winter.

There are certainly possibilities in the slatted floor house for fairly big units, although in no case should I exceed fifty, a size of house that is reasonably easy to move. This system of housing cannot be used with success on all soils and in all climates, and with all breeds. These points appear to be overlooked. They are serviceable on well-drained land which is not unduly exposed and where natural protection is afforded in the way of hedgerows. I should certainly not expect them to give the best results on heavy clay land in a very exposed and bleak situation.

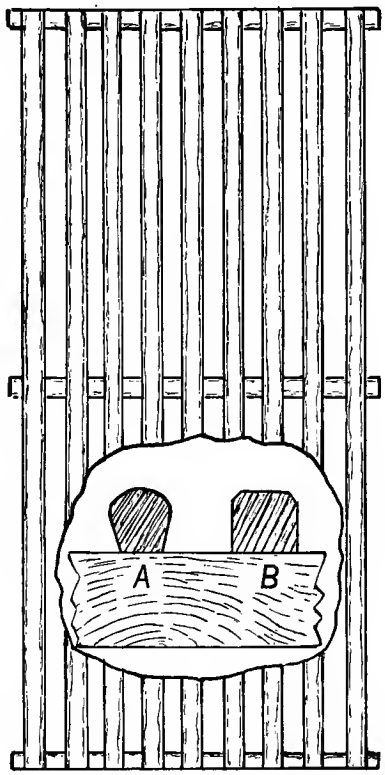


FIG. 44. A SLATTED FLOOR

A 3 ft. by 1½ ft. section of the floor of a Sussex night ark. The three slats used as braces must overlap half an inch each side. *Inset.* Sections of slats cut from 1 in. square deal. *A*, the correct shape to provide the fowls with a comfortable foot-rest and to enable the droppings free passage to the ground. *B*, a shape frequently met with and made by bevelling the top edges, but very apt to hold the excrement. When the slats are made, sand-paper should be used to ensure a smooth surface

For Winter Production

General-purpose breeds and first crosses appear to thrive better on this system than do light breeds, although the latter under certain conditions can be hardened for winter production. That it is suitable for winter laying on free range is very evident in a letter sent to *Poultry and Poultry Husbandry* from a Yorkshire correspondent, in which it was stated that fifty White Wyandottes had averaged over thirty eggs daily since October, while one day, when the snow was on the ground, forty-seven eggs were collected from these birds—proof that fowls in slatted floor houses can lay in spite of the weather.

On this point, however, a Scottish poultry-farmer's experience with birds kept in slatted floor houses on a fairly open farm is that he cannot get the same egg output from them in winter as he gets from fowls in solid floor houses, and he also finds that the stock usually consume more food in the slatted houses than otherwise. Other poultry-keepers are of the same opinion as regards food, the theory being that the birds have to spend so much of their time outside in all weathers that it makes them consume more to keep up their body condition.

As far as I have observed with different types of houses, there is little in it. I find the results in winter are about the same, although perhaps hens in modern laying houses do lay a few more eggs; but there is practically no difference in the consumption of food, because all layers in full production are full feeders. One poultry-farmer told me that, compared with the usual laying house, labour in connexion with slatted floor houses costs him 25 per cent more, and yet another, also farming poultry on a large scale, declared that by the use of small houses on sledges, one of his men looks after 2500 fowls as against 2000 in flock houses.

Providing Shelter

Lack of a place where the birds can shelter from storms or great heat, of a dry dusting place in winter, and of a spot where they can have their grain ration in the dry and scratch for it in straw, has been mentioned as the stumbling-block in the adoption of slatted floor houses. A Kincardineshire correspondent recently asked my advice on the matter. He contemplated housing all his laying stock on the system as increased accommodation became necessary for his growing fowls. He found the slatted floor house quite satisfactory during summer, but doubted if it would be so in winter, because in his part of the country "the birds may have to be closed up for several days consecutively." In such circumstances I advised him to give it a trial on a small scale before changing over completely. There is, of course, no opportunity in the houses for exercise, so that during the spell of confinement mentioned the pullets could not possibly do any scratching for grain or indulge in a dust bath. They would have to stand around, which might not be good for them.

I assured him, however, that fowls kept in such houses, in the south of England at any rate, do not come to any harm on account of sleeping on the slats in winter, provided the house is properly ventilated;

that is, the slatted floor will not be too cold for them in severe weather or during frost. If there were, on his range, natural protection from sharp winds—and that is essential for the successful keeping of layers under almost any conditions—this particular house is an excellent one for egg production at all seasons. On a bare wind-swept field, however, I should certainly hesitate to use it. My experience with it during snow was when, some years ago, we in the south had one of the most severe spells of it. The land was ice-bound and snow-bound for weeks on end but the slatted floor birds were not compulsorily shut in, except at nights, and production was well maintained. I must admit though, that they were on a well-sheltered range with spinney and hedgerow in which to exercise.

The question of providing shelter in severe weather for laying stock in this type of house was once put to readers of *Poultry and Poultry Husbandry*, and the prize was awarded to Mr. Alex J. Ross, of Dingwall, who had been experimenting for some time with various forms of shelter for birds on free range and accommodated in slatted floor houses. The suggestions he made were as follows—

Use only houses fitted with 12 in. or preferably 14 in. iron wheels, and having 4 in. by 2 in. axle bars below the lowest framing of the house, so that sufficient head room is left underneath the droppings' boards for birds to shelter there. Fit a light screen or shelter constructed of felt on a 2 in. by 1 in. frame, the screen being 16 in. wide and extending the whole length of the house, and secured by iron hooks to the underside of the food compartment. The screen can be raised or lowered at will, and when raised and kept in position by thin iron rods hooked on to the walls of the house, it forms an effective shelter from rain. A third screen can be placed against either gable of the house.

In wet weather, when there is little or no wind, both side screens should be raised and hooked into position. In stormy weather the screen on the lee side of the house can be left in the raised position, but the screen on the weather side should be lowered, and the third screen placed in position at the gable end, thus forming a right-angled storm-proof shelter. I have found this method to be far more satisfactory than any other involving the use of innumerable small wattle hurdles (which incidentally are neither rainproof nor windproof) or wooden shelters round about a house, which require to be firmly pegged down to resist a gale, and have always to be dismantled and re-erected every time the house is moved to fresh ground.

In a subsequent issue of the journal Mr. Ross supplemented the foregoing information. While he did not claim to be an expert at poultry-keeping, he had studied in minute detail the slatted floor system of housing, and for eighteen months had been carrying out continuous experiments, including outside shelter and ventilation. This had led him to the conclusion that manufacturers of this type of house should fit wheels on them so as to allow birds to shelter underneath in comfort, and with the addition of side screens and one gable screen the shelter problem would be solved. In a 10 ft. by 8 ft. (80 sq. ft. floor space) house holding 100 layers, and fitted with such screens, there was shelter of 100 sq. ft. underneath the house, which he claimed, was more than ample. During stormy weather the screens are kept firmly down by two iron bars projecting about 1½ in. into the ground, the bars being bolted to the frame of the screen and bent at the top to form a hook, which in turn is attached to a U-shaped eye screwed to the underneath of the food compartments.

Night Feeding

Mr. Ross also explained how he managed to carry out night lighting, which is generally regarded as impracticable and has sometimes been instanced as one of the disadvantages of this type of house. His houses are lit by flash lamp bulbs run off dry batteries, the bulbs being fixed inside the food compartments and just above the mash troughs. After tricking the birds for a week or two with grain troughs, he taught them to eat heartily of dry mash whenever the lights came on; and in December, 1932, his pullets were producing at the rate of 60 per cent to 70 per cent "in spite of the very worst weather."

Although there are what may be termed standardized models for this system of housing, a somewhat bewildering choice of design, size and capacity is being extensively advocated, and it is probably due to this that many poultry-keepers are deterred from giving it a trial. The question of underneath ventilation is apparently still a difficult one to settle by several makers of these houses. Some allow air space all round the house, which is the plan I adopt, and with success; but others fit baffle boards on hinges, any of which can be closed according to the direction of the wind. There are houses, too, with only the two gable ends open, while in others the gables are boarded up and air inlets left along both sides; and the actual air space varies from 1 in. to 5 in., and in one it is 1 ft. All round ventilation is certainly essential in summer; and I have not found it too cold during frosty weather. The fitting of baffle boards may seem to be suitable in theory, but I have never tested it, for the very simple reason that the results obtained by an all round opening have proved satisfactory.

On this point Mr. Ross said he fitted two self-registering thermometers to his 10 ft. by 8 ft. house, and found that with a 2-in. space all round for underneath ventilation the difference in temperature in cold weather was fairly constant at from 9 to 10 degrees —the inside temperature being fixed at 6 degrees above the level of the slats. In summer the difference

averaged about 3 to 4 degrees only, but at that time the house was not fully occupied.

Food Troughs and Nest Boxes

My fowls do not roost under the house, not only on account of the manure board being on the ground, but because it is netted around to keep the birds out. Neither are side and gable screens fitted, shelter being provided, when necessary, by hurdles or a shed as already described. When large houses are in use, however, wheels and screens would doubtless prove

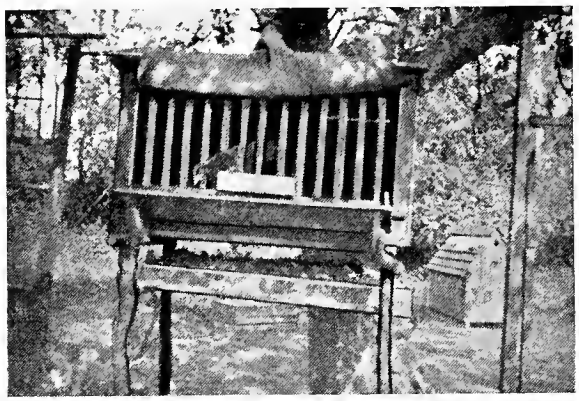


FIG. 45. A "BROODY HEN" COOP

This coop, large enough for eight hens, is erected under the shade of an old apple tree. It has a sparred front and floor, with a movable manure tray 6 in. below the latter, and is fixed on 4 ft. 6 in. "legs." A piece of light sacking—seen on the roof—is used as an awning during very sunny days

serviceable if the fowls could be prevented from entering the house during the day. Food compartments inside are mentioned in connexion with the house used by Mr. Ross. Some of the latest models on the market are so fitted, while others have, in addition, a double row of nest boxes as well as a broody coop outside at one of the gable ends. The birds have to go inside the house to feed and to lay, which, of course, necessitates the food compartment and the nest boxes being closed at night. Otherwise, as I have found when experimenting with houses so fitted, some of the birds will use them as sleeping quarters. How my nests are arranged has already been explained in connexion with Sussex night arks—they are placed outside, a few inches off the ground, generally a brick high.

The mash troughs, known technically as hoppers, are also outside, weather-proof and rat-proof; but even though not open all day they are scarcely sparrow-proof, because unfortunately the sparrow is among the enemies of the poultry-farmer and will, as it does, enter the most up-to-date laying house through the fowl exit for the purpose of eating and fouling dry mash, and even wallowing in the meal for dusting. Rats, too, are a nuisance. I have yet to find the dry mash trough which will prevent any waste of meal while hens are eating from it; hence, food unavoidably dropped through the slats when the troughs are inside the house, or available from inside, attracts rats. I have tried fixing the troughs outside, on the back of the house and about 2 ft. from the ground with platforms on which the birds could alight to feed; but few of them went inside the house to get food or troubled to use the outside platforms. I had, therefore, to return to the original method of placing the troughs on the ground. Outside nests do not require closing; the attendant is apt to omit shutting up nests which are available from inside—I have done so, more than once, hence my putting them outside.

Dealing with Broodies

Even with such fresh air conditions as the slatted floor house provides, it sometimes happens that a hen or two will become broody during the warm days of spring or summer. It is a natural instinct, although keen breeders endeavour to breed it out by careful selection, and it happens in cold as well as warm climates, because after all some hens will cluck. It is perhaps a good idea to attach to the house a "broody" coop—a wired or slatted cage with a solid top—to which the bird is confined and generously fed and watered until she is ready to resume laying. And here let me remark that hens should be removed from the flock immediately they show signs of clucking, not only because they get in the way of thrifty layers, which generally results in broken eggs or in the eggs being partially incubated, but the earlier the broody hen is checked the sooner is she likely to be brought into lay again. However, I find it more convenient to have such hens taken out of their runs and kept together in a range of coops specially made for the purpose; it facilitates matters and does not upset the routine, because anyone can see to the "cluckers."

When the management is as it must be if success is to be achieved, layers give good results when kept on the slatted floor system; and although I once saw it in vogue in a back garden—which was a mistake with such shortage of room—it can be adopted wherever there is sufficient land to ensure the house being moved about the run, such as on the general farm and in meadows and orchards. For extensive range used for grazing, however, I question if more than 100 birds should be allowed per acre, although much will depend on the quality of the land. I should certainly not attempt this system, even on a small scale in single unit runs with a maximum of 100 sq. ft. a head of ground.

As to a suitable class of fowl for such conditions, I have been most successful with general-purpose kinds

and first crosses, although at a farm near by White Leghorns are giving good returns in a sheltered position. I find also that fowls which have been reared in night arks from the time they are off brooder heat as chickens give better results in their pullet years than those which have to get accustomed to slat roosting at their matured stage or when coming into lay for the first time.

Hen-exits not Necessary

A further important point in connexion with slatted floor houses is that they should not have the orthodox hen-exits or "pop holes." I doubt if such a contrivance was ever seen in a Sussex night ark; but now that this system has been elaborated to accommodate as many as 200 layers, some of the most recent models are so fitted. It is a mistake, and they are objectionable for more than one reason. When open they create a very severe draught, which is quite perceptible even with the open floor. They are so small, also, that the birds are not encouraged to return to their house for shelter on rough days, while opening them in the morning to release the inmates causes trouble and frequently results in injury among the fowls—the exit is scarcely large enough to allow a big bird to pass through comfortably. This is particularly noticeable with young stock, and I have experienced it more than once.

By far the better plan is to throw the attendant's door (on the gable end of the house) wide open and fixed back, having a hinged hood over the aperture if necessary, or to fit the bottom half of that door with a flap hinged at the top to open outwards. The width and height of this flap, as I find, allow ample space for quick and easy exit and, moreover, expose most of the floor space to the light. I know that fowls on free range generally have an aversion to entering their sleeping quarters during daytime; but I have seen fowls at rest on the slats during a severe downpour of rain, when the flap has been in use. After many experiments I feel sure the maximum for a unit is fifty fowls.

Cabins and Colony Houses

Both cabin and colony houses have been seen for a great number of years on farms where fowls are kept in the fields; and even though progressive poultry-keepers of the present generation are apt to consider them as altogether out of date, they are still in use in many parts of the country. They are portable; and although the former was invariably of small dimensions, of recent times "cabin" has been applied to a large permanent laying house which originated in Lancashire.

The cabin of my early days was a sturdily-built floorless hut, capable of accommodating a score of hens on two perches and devoid of nest boxes, since the fowls made their own nests on the ground. It was of the lean-to type, ventilated by means of a small wire-netting window and the door, and, generally, three or four 1-in. holes near the highest parts of the roof. I have two such cabins on my farm and they have done and are doing good service, since while fowls are not at the moment roosted in them, one serves as sleeping quarters for a pen of Aylesbury ducks and the other for half a dozen Chinese geese. They have, however, been tenanted by breeding pens of fowls of different kinds, as well as by young stock in their growing stages.

One of these cabins is 6 ft. by 4 ft. 6 in. deep, 5 ft. high in front and 4 ft. at the back, the roof overlapping all round by a couple of inches; and there are five 1-in. holes just under the higher part of the roof at each end. The front consists of a 2 ft. 9 in. wide door, the remainder being solid except for a 1 ft. 6 in. square wire-netting window with an up and down glass shutter, which is seldom closed. The door, capped with a 3 ft. by 1 ft. 3 in. flap hinged at the top, is left half open all through the day in winter, no matter what the weather, and is so kept by an iron hook and staple. As a fowl house it was fitted with one perch at the back, leaving the front clear as a day shelter when the necessity arose. The place is littered with straw, or cavings, and the house is moved whenever the ground around it appears to be getting worn.

The second cabin is 4 ft. 6 in. by 4 ft. deep, 5 ft. high in front and 3 ft. 6 in. at the back; it has a 2 ft. 4 in. wide door and a "window" of old stair rods, about 16 in. by 23 in. wide—a crude affair, mayhap, but most serviceable for a small breeding pen of fowls or the half-dozen geese now in residence. These cabins are easy to construct and cost little for material, including the roofing felt with which they are covered; and they are very handy for rough land near the hedgerow.

Old-type Hen-cotes

Colony houses, now dignified by the title "Portable Field Houses," are, as they were, portable houses for use in the fields, but by general farmers rather than specialist poultry-farming farmers—by whom I mean those skilled in agriculture who are wise enough to make a speciality of poultry husbandry on up-to-date lines. About thirty years back the colony house differed from the cabin, in that it was constructed with a span (or apex) roof, had a wooden floor, and was fixed on wheels. It was made to accommodate from 50 to 100 fowls according to the size and nature of the field in which it was located at different seasons, although in winter it was almost invariably drawn up

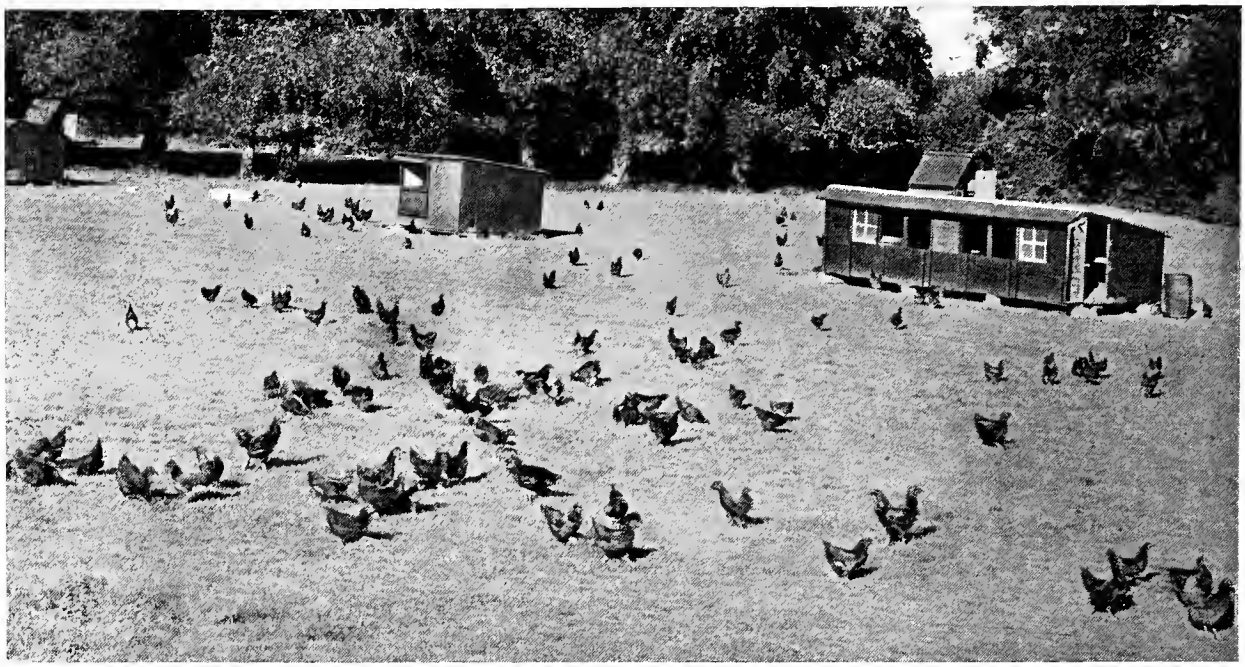


FIG. 46. PERMANENT FOWL HOUSES

The large lean-to house on the right has a half-open (wire-netting) front fitted with two glass windows and up-and-down shutters, two of the latter being closed. The door should be hinged on the right. The other lean-to house, on the left, is of a pattern in common use about thirty years ago. One half of the front consists of the door, and the other has a wire-netting window, topped with a hood, and fitted with an up-and-down wooden shutter. A house similar to this is on my farm at present, since it comes in handy for a pen of ducks or odd hens

FIG. 47. SLATTED FLOOR FIELD HOUSES

These field houses, of the night ark style, are fitted with outside dry mash hoppers, the idea being to keep the food out of the reach of vermin

within easy reach of the farm buildings or the stock yard, for greater protection from rough weather and to facilitate feeding the hens. Its chief features were the number of perches it contained and the shelter it provided for the birds, because it was for roosting purposes only, not a scratching shed as well, and being set in the centre of its own field—not more than one house was placed in one field—it had to accommodate its colony of fowls with shelter and shade from rain-storms or full blazing sun.

One of these field houses I recall—it is still doing good service—is 8 ft. long by 5 ft. wide, 6 ft. 6 in. high to the ridge and 5 ft. to the eaves, and it is the roosting place for fifty hens, generally pullets taken out to complete their growth and get into lay. This house has seven perches fixed about 2 ft. from the floor and 1 ft. from the back and from each other. It has a range of outside nest boxes (just free of the wheels) which the fowls enter from the perches inside the house, the nests being boarded up until the pullets come into production. In the gable end, high up, is a 2-ft. square glass window over wire-netting, which is left open in summer, while in the opposite end is the attendant's door, 3 ft. by 5 ft. high, which is boarded up except for a wire-netting window at the top, and above the door almost at the peak are half a dozen 1-in. holes.

As can be imagined, the old-type hen-cote, as it has been called, leaves practically no room for fowls on the floor. When going to roost they get on the first perch and hop to the back, and as they settle down so do they remain throughout the night. The door is left open all day, hence the birds soon become accustomed to this mode of perching and also to the nests, it being rare to find that eggs are laid away in the hedges.

Another colony house which was a familiar sight when I was residing in Buckinghamshire a few years ago consisted of an ancient farm wagon—it was nearing its half century when I last saw it, but still going strong—with an ark-shaped top and well-thatched roof, and fitted out for about 200 fowls, young and old stock. It was the owner's custom to bring the growers and the moulting hens into the stubble fields as the grain was harvested, and to leave them on such land for a month or more; and he was one of the few farmers who did well out of his poultry. It has been said that the wild life which fowls lead under such conditions must tend to force them back to nature to such an extent as to make them roost in the trees and generally to deteriorate as layers. This is not my experience, because although the fowls are in most cases thoroughly isolated they are not neglected, one visit *per diem* by their attendant being essential. As it is, those who complain of lack of stamina in pedigree-bred laying stock would find it very beneficial to adopt the colony house system. Fowls are not highly gregarious by nature and small groups of them, given a wide range on which they have to "rough it," become remarkably hardy.

Portable Field Houses

There is no necessity, however, to resort to the old-type hen-cote or the "stubble wagon" for such a purpose, suitable as they undoubtedly were under the conditions which then prevailed, because there are now available portable field houses of various designs, in addition to the Sussex night ark and the slatted floor house already described. Some of the latest models embody the eaves and ridge ventilation of the ark, although not the open floor, while at least one of them has the close perch arrangement that was a feature of the early colony house mentioned above. Others are very similar to an all-purpose type of permanent house known to me in pre-war days—it was made of asbestos cement sheets—which had to serve the birds as brooder, growing and laying house combined, that is, chickens can be artificially brooded in one of these houses from their first days, can use it through their growing periods, and still make it their home during their first full year of production. And yet, different as are the models of to-day, each is capable of yielding excellent results in practical hands.

Among the most noteworthy of these field houses I have seen is the one designed by Mr. H. P. Hamilton, the well-known poultry pathologist, and which he uses on Battle Farm, Goring-on-Thames, in considerable numbers. Proof of its efficiency is the fact that chick losses are negligible, while each season 1500 layers and 3000 chicks are handled with a minimum of labour. The house is span roofed, 8 ft. by 6 ft. 6 in. inside measurements, 7 ft. high to the ridge, about 5 ft. 6 in. in front and 4 ft. 6 in. at the back. The top half of the front is practically all glass, and there is a window in one gable end; and as there is eaves and ridge ventilation the interior is light and fresh. The floor is made of $\frac{3}{4}$ in. tongued and grooved boards on strong joists, to which oak skids are secured. The house is not constructed on the slatted floor principle, but about 9 in. above the general floor level there is a false floor of 1 in. square mesh No. 9 gauge galvanized iron wire, stapled to strong wooden framing, and hinged to lift up. The fowls sleep on the wire mesh lattice. When in use for layers, three tiers of nests are provided, to which trap fronts can be fitted if desired. Each tier is made accessible to the birds by a hinged platform, the platforms being interconnected so that by one movement from outside the

house they can be pulled up and the nests blocked to prevent fowls sleeping in them.

The nests are hinged at the back, so that eggs may be collected outside if preferred; but there is ample room to stand up inside, the wire floor being sufficiently strong to support the weight of the attendant without sagging, a little matter that I thoroughly tested. The food troughs are carefully constructed for outside filling, but are accessible to the birds from inside as well as outside the house. They are 7 ft. 6 in. long, the outside one being practically on the ground so that the fowls eat from it with ease; a hinged flap renders it rat-proof when closed and also affords protection from the weather at any time. It holds 2 cwt. of mash, and is so designed that no clogging can take place.

One other feature I noticed is the fowl exit or "pop hole"; it is in the gable end under the window and opposite the door. This, Mr. Hamilton told me, is so that when the attendant enters the house any birds in it can walk straight out instead of being trapped and frightened, as may be the case when the only exit is in or near the door. No doubt such an arrangement is the best when large field houses are being used; and this one accommodates 100 adult hens, or when adapted as a brooder house (by taking out the wire floor and the mash trough and fixing the chick panel in position) 200 chickens up to six weeks of age.

Ample Land Required

The reader will probably agree with me that colony houses, whether with slatted or wire floors or numerous perches, can scarcely be serviceable unless there is ample land on which their positions can be changed as frequently as appears necessary to prevent the ground becoming fouled, or even at such intervals as ensure the grass being kept in good condition. It has been suggested that houses of this type, on a small scale, are suitable for intensive purposes if set alongside a scratching shed; but they would then become fixtures, and, moreover, the combination, besides being more costly to erect than an "all-in-one" intensive house, would not be intensive poultry-keeping proper. Anyone with such limited quarters as to make intensivism essential would be ill-advised to attempt it. Field houses are for use in fields and were never intended to be put up in gardens.

As regards the necessary amount of land to allot when the colony system is adopted, one farmer allows fifty hens a minimum of one acre for twelve months, and moves each house (containing eighty hens) three times or more its own length once a fortnight. Much, however, will depend upon the quality of the land, because I have seen the system successfully carried on with 100 fowls to the acre, and less frequent moves.

As I have shown, when colony housing first came into vogue, the colony was one flock of fowls using the same house for roosting purposes and having one field to itself. In such circumstances the house, being in the centre of the field, was seldom moved except to bring it back to its winter quarters, and the birds were so fed that they thoroughly ranged their own field and benefited thereby. Nowadays, however, it is becoming the custom to arrange field houses in single rows, each house a few yards from its neighbours, similar to the method adopted with slatted floor houses. Under that arrangement it strikes me as being imperative to make a fortnightly move, because such crowding of the houses is likely to foul the land in their immediate neighbourhood much sooner than under the old system.

The Fold System

It is well known to poultry authorities that "sweet" land is essential for the successful keeping of fowls in the open. How to prevent the runs becoming "fowl-sick" is a problem that many have to face when the range is limited to a small area; hence their thoughts turn to the folding system. To prevent the fouling of land that is being devoted to poultry is not, however, the chief object of keeping fowls on this system, but rather that by adopting it there is every hope of improving the land. On grassland, for instance, one is assured of the manure from the birds being spread thinly, and of the surface being vigorously scratched over. Considerable success in the improvement of poor meadows has been achieved in this way, and it is said that heavy yields have been obtained where previously the grass was not worth cutting. It is beneficial also on land which is being prepared for cropping, because the birds devour an enormous quantity of noxious grubs. This natural food, too, besides promoting health does much to keep the corn bills down. With these facts becoming known, it is not difficult to see why the folding system is so popular among general farmers who turn their attention to poultry.

There is, admittedly, the question of labour, because to be of the utmost benefit each unit must be moved to an entirely fresh patch of land once a day. Nevertheless, those among my acquaintances who do fold their fowls assure me that the labour of moving is a small item compared with the benefits accruing from it. It will be understood that the folding system is unsuitable for small spaces, at any rate as far as adult fowls are concerned, although I have seen it practised successfully for the rearing of chickens. In fact, among my earliest recollections of that method of chicken rearing was when, in 1890, I saw a portable continuous brooder on wheels which had been set up

on a poultry farm in Berkshire. However, the best results with laying birds are obtained when ample grassland is obtainable; and it must be well-drained land that is reasonably level. It would be most unwise to attempt the folding of fowls on anything approaching a swamp, while it can scarcely be adopted for hillside poultry-keeping.

As to the number of stock which can be kept to the acre, I should seldom exceed 200 in the best situation, although one maker claims that, in units of twenty-five, 300 fowls may safely be allowed to the acre "only coming back on the same ground once in every forty days, and no foul land." In my opinion, however, 200 per acre should be the maximum for grassland, unless it is particularly dry and good pasture.

When dealing with the question of accommodation in the preceding chapter I went fully into the pros and cons of the folding of fowls; and while mentioning that fifty birds can form a fold, I much prefer not to exceed about two dozen as the unit, simply because the whole structure must be made to stand hard wear —the life of the usual fold house is about five years, when well treated—and yet it must not be too cumbersome to be easily moved, since it has to be placed on fresh ground daily. It should be lightly built for portability, but not so light that it can be toppled over in a gale or damaged by animals. In this matter I am told that cattle and sheep may be grazed in the same field without danger of damage to the house, but that material damage is likely to be done by horses. But I should be nervous of putting fold houses on the same pasture land as horned stock, unless the structures were particularly substantial.

Various Designs

Now that the system is popular it can be imagined that several designs are on the market; but while some are obviously more mobile than others, I am afraid that exaggerations have been made as to the ease with which these houses may be shifted about. Handling fold units on a tennis lawn or a boarded floor is vastly different from doing so on meadow or arable land; so although a boy might accomplish the move under the first conditions it would require real manual labour to make the move when the going is rough.

The models now before the public vary not only in design but also in name. Thus some are apex-shaped and others ark-shaped, while there are those with lean-to roosts and flat-topped pens, since each must be complete with sleeping quarters and an open run. They are met with, also, as folding or fold units, hen folds, and fold arks. The vast majority of them are constructed to be moved bodily; but in a few, and particularly when a Sussex night ark forms the roost, the run is separate, while in at least one I saw at an agricultural show the run was made to telescope over the house for easier handling. Then, too, some models which makers term "portable folding units" are fitted with wheels (either caterpillar or 15 in. iron with 3 in. tyres) at the roost end, while one has a semi-circular lever there, and yet others are without wheels and have to be lifted, although some makers supply special moving gear.

The design to select must depend to a large extent upon the nature of the land upon which the fold is

FIG. 48. AN APEX FOLD UNIT

A one-piece fold unit suitable for a dozen hens. The roost (slatted floor) is on the left, while the mash hopper and water trough are placed under the shelter at the opposite end. This size fold can be easily handled

going to be used; but no matter what its shape, whether apex, ark, or lean-to, it must be mobile, correctly ventilated, and easily accessible by attendant and birds to the nests and food troughs. For pasture that is in any way exposed, and also for arable, the apex type appears to be the most popular, possibly because it is less likely to be blown over, while when on grazing land it is perhaps not so apt to be damaged by cattle. Most models of this kind have 1 ft. high walls, and each side of the apex is boarded up about one-third or even half-way, the remainder of the "roof" being of wire-netting; thus the fowls are afforded some protection against wind and driving rain. A fold of this sort, covering an area of 100 sq. ft. —20 ft. long overall by 5 ft. wide ground space—and 4 ft. high to the ridge, will accommodate twenty-five hens; but as the sleeping section is 5 ft. long, it reduces the actual run to 15 ft., which has to include a roofed platform—at the opposite end to the roost—for the water vessel and the dry mash trough. Thus the ground permitted for exercise is less than 3 sq. ft. a head, which, however, is ample, considering that the unit is moved daily.

Special Nest Boxes

This fold has ridge ventilation for the roosting quarters, and a slatted floor about 1 ft. from the ground; but as space must be left at each side of it for the nest boxes—sunk about 6 in. below the level of the slats—the floor itself, although 5 ft. long, is less than 3 ft. wide, which means fairly close quarters for the number of birds it accommodates. This often induces some of them, especially young hens just coming into lay, to sleep in the nest boxes rather than on the slats. Hence it is essential, in order to prevent the boxes getting fouled, to fit them with wire-netting bottoms and not to put hay, straw, or any other nest material down. The birds must lay on the wire itself, although some will perhaps deposit their eggs in the run. However, most of them take readily to the nest boxes, since at times hens are accommodating; and if the wire-netting is made with a slight slope downwards from the slats to the sides the eggs will generally roll out of the way. They can, in fact, be kept out of sight by a simple device I invented many years ago when troubled with egg-eaters among my hens. This consists of fitting a false back to the nest, made of wood and soft felt, with a 3-in. space behind it, the edge of the felt just touching the wire bottom, so that the egg rolls beyond it. Some such arrangement as this is essential with nests so made, because if the eggs are exposed they are apt to get broken; and egg-eating generally follows.

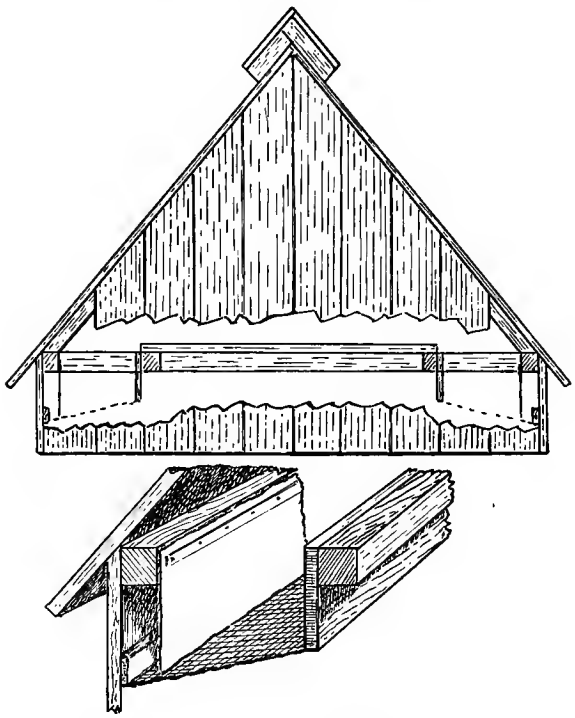


FIG. 49. A FOLD (END)

The above represents the end (roosting section) of the 2 ft. by 5 ft. fold described in the text as being suitable for use on an exposed field. It is apex-roofed, has 1 ft. high sides, also ridge ventilation, and is 4 ft. high to the peak. Part of the boarding is shown as missing, to indicate how the nests and the slats are arranged, these latter being fixed from side to side on the cross supports to which the nest board is secured

Below. The nest, with wire-netting bottom 6 in. below the level of the slats, the bottom sloping downwards, and showing the false back and the thin pad of soft felt

As to other types of folding systems, the Sussex night ark and the lean-to kind strike me as affording better means of housing the stock, allowing more head room and the use of nests beyond the walls, while a detachable run makes far easier handling. This is, of course, more costly to build, but it makes a most substantial structure and entails little extra labour for the daily move. In any case two persons should be employed in shifting the fold, even when the house and run are all in one, if merely to prevent undue straining and warping of the framework. I find it better, also, to move the fold its width rather than its length, although when fitted with wheels, lengthwise is the only way it can be shifted. All this work I prefer to do by hand rather than by motor tractor or horse; and that is why I should never have the unit larger than the size stipulated.

Simple as the best folding system may appear in the show room or as it stands on a good meadow, it is not always so to manipulate. One fault common to many of them is that the birds are never shut into their sleeping quarters; consequently, when they have to be moved, great care has to be exercised that no bird is injured, because some of them will attempt to get out, while few will move forward with such precision as to keep clear of the framework. For this reason the larger type, the ark and the lean-to, appeals to me, because the birds can be confined to it at night and not released until the whole fold is shifted to its fresh patch. Admittedly, this means making the daily move in the evening; otherwise it necessitates two visits, a very early morning move and a shutting-up round, which latter could be done by the owner himself.

I have mentioned the trouble which may arise when nest boxes are arranged (in the apex fold) on a level with the slatted floor. This is not altogether obviated by outside nests, which must be available to the fowls from inside the ark or the lean-to, although I find that with more head room the birds are less likely to sleep in the nests. Admittedly these boxes could be arranged at the end of the run, quite distinct from the roosting quarters, provision being made for the water and food troughs under the floor of the house. But even that arrangement might not prevent some hen or other laying on the slatted floor; and, after all, the end of the run is the most convenient place for the troughs, since they require regular attention.

However, with these apparent little drawbacks, the folding system is very popular with general farmers and with poultry-keepers who have ample grassland available. It ensures healthy stock, results in good production, and effects economies in feeding when properly carried out. Fold houses are now made in so many varieties that there is no difficulty in finding a suitable structure for any particular requirement.

Modern Laying Houses

These houses are fixtures, and they embrace large flock scratching shed and semi-intensive houses, and Lancashire cabins. They came into vogue when it was discovered that layers, and especially spring-hatched pullets, would produce eggs in winter if they were provided with dry and warm quarters, some place in which they could shelter and work when wet and cold weather prevailed.

We have a habit these days of calling them modern laying houses; and yet they are modern only in their fitments, because as I found in a book published more than a century back—a fact I recorded many years ago when writing of the intensive system—such accommodation was advocated as the best means of getting out-of-season eggs from young hens. It was reading that account which gave me the idea of winter egg production from pullets; and, although at the time I was able to attempt it on small lines only—half a dozen houses each holding not more than a dozen birds—it proved decidedly successful.

Among poultry authorities it is generally supposed that the large flock system of housing fowls was not attempted until Mr. S. G. Hanson had demonstrated at his poultry farm near Basingstoke, Hampshire, that methods he had found successful in Vancouver Island, B.C., were possible in this country. As a matter of fact, the first house of this kind that was to my knowledge built in England, to be used solely in connexion with commercial egg-farming, was the one erected when my brothers were keeping poultry in Chesham, Buckinghamshire, about 1900. The younger, the late M. Taylor Broomhead, had returned from a long spell abroad, part of which time he had spent in a close study of American methods of poultry-keeping which were then vastly in advance of ours.

FIG. 50. A NIGHT ARK FOLDING UNIT

How an ordinary night ark may easily be converted into a useful folding unit, by attaching a light-frame wire run, as shown above. The photograph was taken on the Kent Farm Institute, Borden, near Sittingbourne

Therefore when he and my elder brother (Fred. J. Broomhead) went in for poultry-farming as a business proposition, they erected on their land two types of American laying house. One was "The Tolman Fresh-air Poultry House" to which was wired off a grass plot of one acre, while the other was made to the design of those on the "Million Dollar Egg Plant," and set in a 10-acre meadow.

American Models

The former was a plain, hip-roofed building, with ridge ventilation and having a long slope of the roof to the front (south), the ridge being two-thirds back. There was a casement window 2 ft. 6 in. square in the west side (about the centre of the long slope), while the attendant's door was directly opposite—on the east side—both having wire-netting fitments for use in summer. The house was made of 1 in. tongued and grooved boards, thus ensuring a good substantial roof, and north, east, and west walls. The front, of 1 in. mesh wire-netting (except for a 9-in. board along the

bottom), was entirely open, both day and night, storm or shine, all the year round, the overhang of the roof keeping the floor reasonably dry. The ground space was 294 sq. ft. the house being 14 ft. by 21 ft. from front to back; it was 4 ft. high in front, 7 ft. 6 in. at the ridge, and 5 ft. 6 in. at the back, and accommodated 100 White Wyandottes when used for semi-intensive purposes. The other building was a lean-to one, 150 ft. long by 12 ft. deep, 7 ft. high in front and 4 ft. at the back, the front being wire-netting with

FIG. 51. A HOME-MADE LEAN-TO HOUSE FOR LAYERS

This house, 8 ft. by 10 ft. deep, 7 ft. 6 in. high in front and 5 ft. 6 in. at the back, accommodates two dozen layers—in this case Rhode Island Red pullets. The front contains a wire-netting ventilator, 2 ft. by 7 ft. (which has a 2 ft. 6 in. by 8 ft. movable weather-board to cover it), and five pieces of 1 ft. 6 in. high by 1 ft. 2 in. wide glass. There are three floor lights (seen left of the door) and also a small window (hidden by the open door) 3 ft. 6 in. up. The house contains nine nests and two perches over a droppings' board, while there are two windows in the slide of the fowls' exit, which is opposite the floor lights

three rows of muslin shutters and a hood of waterproof calico. Its capacity was from 600 to 700 White Leghorns.

Certain alterations had to be made in both of them, but they eventually proved satisfactory for the purpose, eggs being almost as plentiful in winter as in mid-spring and summer. Keeping in close touch with that farm gave me an excellent opportunity of studying large flock housing in its early days, while in more recent times I enlarged my knowledge of it when the journal with which I have been connected for over forty years ran an experimental farm in Surrey, at which what is known as "mass production" was thoroughly tested out on the most up-to-date lines. To Mr. Hanson, however, is due the credit of bringing large flock housing prominently before the public, because, like so many of those with whom he associated in America, he did not believe in hiding his light under a bushel.

The Hanson System

Intensive egg-farming was in its infancy in those days; but Mr. Hanson made known his own results in order that others might gain from his experience. His system was to house 400 birds in a lean-to semi-open front building, 180 ft. long by 9 ft. wide, 7 ft. high in front and 4 ft. at the back, to allow such a number an acre of land, one half-acre on the south side for use in winter and the other half-acre at the back of the house for summer use. Each section was rested from the fowls for six months out of every twelve, and while vacant it was ploughed, harrowed and sown with a green crop, thus providing valuable food for the flock and keeping the soil sweet.

This type of house is to be seen to-day in some parts of the south of England in well-sheltered positions, but it had to be considerably modified before the system could be adopted in the north of England and in Scotland. It gave entire satisfaction throughout summer; but the fresh air it provided proved to be detrimental during the severe weather which so frequently prevails in those parts of Great Britain at other seasons. In its original form, too, this lean-to large flock house was not always a success in the south of England when located in anything like an exposed position, as I recall in connexion with a somewhat famous commercial egg-farm.

In such circumstances as these the Hanson House is scarcely suitable accommodation for pullets which are being kept for maximum egg production in winter. On the other hand, some difficulty is experienced in regulating the ventilation so that severe draughts will not prevail at times; hence throughout autumn and winter this is very apt to result in colds and worse troubles among the stock. In addition to this, there is that little matter to which I drew attention in the early part of this chapter, and that is, the likelihood of the lean-to type of house being blown over in a high gale of wind. Although this would hardly be possible with a large flock house, I have known when the roofs of such buildings have been "lifted" off during a storm and deposited many yards away; and I once found a small flock house of this kind "standing on its head" as the result of a gale. For these reasons, therefore, the lean-to type of building was a failure with some poultry-farmers, as was the semi-open front. Consequently there came into vogue the more solid span roof house, the front of which is fitted with windows along the top and bottom.

The Lancashire Cabin

The first house of this kind I recollect was during a visit to Lancashire about twenty years ago. The poultry-farmer, who was also an appliance maker, designed it with ridge ventilation; and he made the top (front) windows on what is now known as the hopper style. He called it "The Lancashire Cabin," because it was certainly being adopted in that county

and somewhat resembled a cabin. At any rate, this type of house is generally acknowledged to be among the best for use in any part of the country, whether for large flocks or small lots of birds; and it is the one I favour on my poultry farm, which stands high and gets the breeze. That the ventilation of a large flock house of the lean-to type can, however, be so arranged that the interior is free of draughts, I had ample opportunity of proving on the experimental farm previously mentioned.

One of the houses there was 110 ft. long by 14 ft. deep, 9 ft. high in front and 5 ft. at the back. It was built on a brick foundation, had a wooden floor, and was divided every 20 ft. by a wooden partition from floor to ceiling, the last 10 ft. of it acting as a food store. The front consisted of movable glass windows 1 ft. from the bottom, then wood—the back of the range of trap-nests inside the house—above which were "Lancashire lights" (ventilator windows) and then sliding glass panels. But, and this is the important point, the roof was made of corrugated iron pierced upwards, so that air got out but wind and rain could not enter. The atmosphere was fresh, but no draught was perceptible; and the fact that not one of the 500 White Leghorns it accommodated ever suffered from cold is proof that the ventilation was perfect. Other houses on that farm, those known as the layers (50 ft. by 14 ft.) and the intensive (30 ft. by 14 ft.). all of which were 9 ft. high in front and 5 ft. at the back, had this form of roof, and it was found ideal for lean-to buildings.

Nevertheless, as the vast majority of poultry houses have wooden roofs, generally covered with special felt, the span type is undoubtedly the most popular to-day, whether for large flock or semi-intensive work. It certainly equalizes light and heat, while ridge ventilation keeps the interior fresh. Many of these houses are now fitted with windows at the back to correspond with those at the bottom of the front; and they are made to slide out or to be thrown wide open so that, when necessary, the whole floor can be aired—which is essential in hot weather. In the large houses the depth (from front to back) is generally 10 ft. to 14 ft., but if deeper it will be found advisable to fit roof lights in addition to front and back windows. However, 14 ft. is quite sufficient for all purposes. It is customary also, when the length is 20 ft. or over, to divide the house into 10 ft. bays, by partitions extending half-way across the house from the back. Hoods are fitted only when the windows are made to slide up and down—they are necessary to prevent rain driving through the space when the windows are open —but the use of "Lancashire lights" (ventilator or drop-in windows) can obviate fixing a hood.

FIG. 52. CENTRE-SPAN ALL-PURPOSE HOUSES

Houses of this type can be used for chickens, growers, and adult stock. For chickens they are sectioned according to the size of the broods, while for layers, fitted with perches, droppings' boards, and inside nest boxes. As can be seen, the front of the house in the foreground is of wire-netting with movable glass windows—most of the latter leaning against the building—so that plenty of light and fresh air is available. Fitted with a wooden floor, about 1 ft. from the ground, such a house makes ideal quarters for the rearing of early chickens or the keeping of pullets on the intensive system during winter

For Semi-intensive Use

A similar type of house is required when fowls are being kept semi-intensively, and in this case the floor space should be such as to permit of an average of 2 sq. ft. for each bird. One house of this kind I have

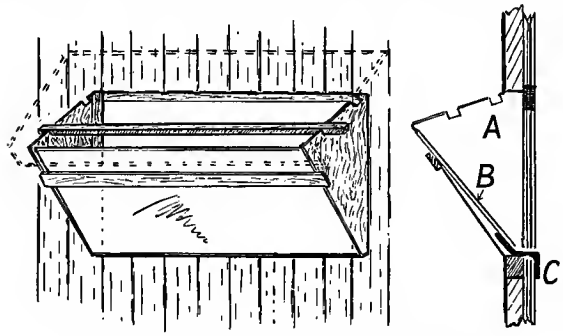


FIG. 53. A VENTILATOR OR DROP-IN WINDOW

This window (seen from ioside the house) consists of a single sheet of glass, not io a frame, which lies in a hopper. When wide open, the glass (*B*) rests on a fixed har; the window can be kept half open or entirely closed by means of a movable bar. Each side of the hopper (*A*) is made of thin hoards or three-ply, and the bottom, or sill (*C*) of metal bent as shown, to prevent rain driviog in. The double dotted lines indicate where the wire-nettiog guard should be fixed, securing it by a couple of staples at the top, so that it can be swung up, if necessary

in use is 10 ft. square (floor space) and it has a centre span roof, with ridge and front eaves ventilation. It is 5 ft. to the eaves and 8 ft. to the ridge, and the roof overlaps the walls 6 in. at each end and 4 in. at the front and back. At the back, 9 in. from the floor, is a row of glass windows, 7 ft. 6 in. by 1 ft. high, which ensures plenty of light under the droppings' board. The front of this house, beginning at the bottom, consists of two floor windows 6 in. up, 3 ft. by 1 ft. 6 in. high, which, like the back windows, are panelled and framed so that they can be entirely removed. Then comes match-boarding for 1 ft. 6 in. (behind which are the inside nests), and above it there are two panelled drop-in windows, each 3 ft. by 1 ft. 4 in., which can be opened for 1 ft. at the top. The fowls' exit is at the side (of the front), a hole 10 in. wide by 1 ft. 3 in. high, fitted with a door to slide up and down, and also with a hooded front. The attendant's door is in one of the gable ends and is 6 ft. by 3 ft. wide. This house accommodates forty Rhode Island Red pullets.

Another type of semi-intensive house on my farm is 8 ft. square, but it is hump roofed, that is, the ridge instead of being in the centre is only 3 ft. from the front. It is 5 ft. high at that part, 6 ft. 9 in. to the ridge, and 4 ft. at the back; and the attendant's door in the gable end is 5 ft. 3 in. by 2 ft. 6 in. wide. The back has floor lights, consisting of two 1 ft. by 1 ft. 6 in. long glass sheets unframed, 8 in. from the floor, and 1 ft. 3 in. from each end, and fitted into grooves to slide out. In the front of the house are two similar floor lights 8 in. up, while at the top, to within 6 in. of the roof, are two 1 ft. 6 in. high drop-in framed windows. The top 6 in. acts as the eaves ventilator, allowing an opening of about 4 in. under the top rail of the house framework; but the roof projects 3 in. beyond the front—it projects such a distance all round the house—and this, with a slight overhang of the roofing felt, acts as a baffle and prevents too severe an inrush of air. The fowls' exit is also in the front of the house.

The Ventilator Window

Perhaps it may be as well to describe the ventilator or drop-in window. When it is casement made, the hinges are at the bottom so that it opens inwards, being kept in place by a chain when open, and by a button when shut. Some fowl houses which are made with this type of window allow air to enter not only at the top, but at both sides, which, however, is a mistake, because it creates a draught that disturbs the birds while they are roosting. For this reason it is very apt to set up colds among the stock. I much prefer the Lancashire light. This is a single sheet of stout glass which rests on a galvanized sill and fits into side pieces (hoppers, to give them their technical name); thus rain cannot possibly enter, and the influx

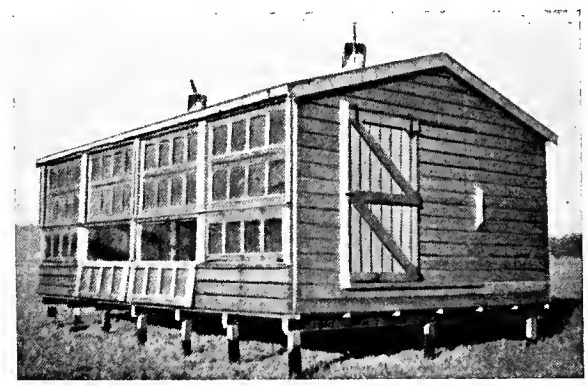


FIG. 54. MODERN LAYERS' QUARTERS

An up-to-date house for layers and for use in an exposed position. The dimensions are as follows: Length 20 ft., depth (front to hack) 12 ft., height to eaves 8 ft. and to ridge 10 ft. As will be seen, except for about 2 ft. at the bottom, the whole front is of glass over 1 in. mesh wire-netting, there being twelve four-panel windows, each of which is movable, so that during summer the interior gets the maximum of fresh air. It has, too, floor lights (also movable) along the entire length of the hack, two sliding doors, and a couple of patent ventilators, while its fitments include three-tier nest boxes, perches, and droppings' boards, which are placed at the back. It accommodates up to 100 pullets for egg production on the intensive system—or twice that number of birds as laying and roosting quarters when range is allowed—and can easily he converted into a four-section brooder house for winter rearing, or utilized for growers. It is built on piles to ensure freedom from rats

of air is through the top only. I make my hoppers of three-ply wood, 1 ft. wide at the top, and notch them in such a way that by means of a wooden bar they can be opened almost any distance up to 1 ft. if necessary.

And here let me remark that 1 in. mesh wire-netting must be placed over all windows which are not fixed, and, too, over the top of the drop-in window. This precaution is necessary to prevent sparrows, starlings, and other birds, as well as rats, finding easy entrance to the house, where, as previously stated, they will eat and often foul any food that may be exposed, such as dry mash in troughs. The guard over the ventilator is very useful to prevent fowls resting on the edge of the window, as they are apt to do if confined to the house. Admittedly, sparrows are not always kept out by thus protecting the windows, because I have known them to enter through the trap-door by which the fowls get to and from their roosting quarters; but I have rarely if ever found them do so when the exit is fitted with a box front that keeps the trap-door out of view—a wooden partition, the height of the hole but three or four times its width, fixed 1 ft. from the house and attached to it by a sloping (lean-to) roof. The two-way entrance may possibly puzzle the fowls at first, and particularly if they are nervous pullets; but they generally soon get accustomed to it. This little contrivance certainly checks sparrows, and, moreover, it ensures the floor litter near the trap-door being kept dry. However, sparrows, and starlings also, as well as rats, must not be allowed to enter the house because they are disease carriers.

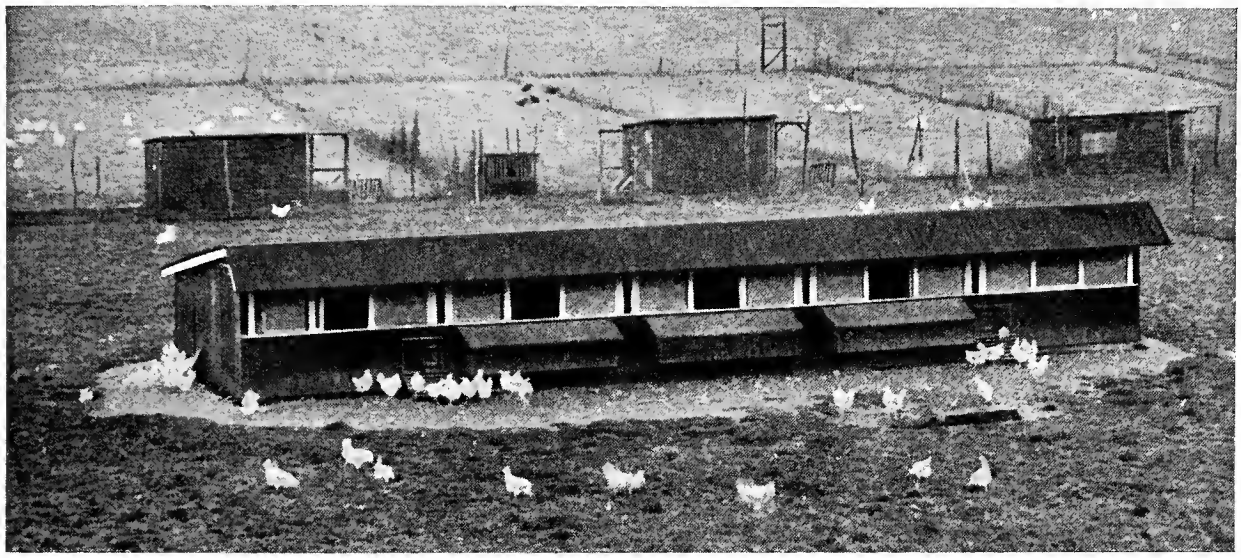


FIG. 55. A PERMANENT LEAN-TO FOWL HOUSE

This lean-to house bas a fixed weatber-board, while the front of it has sufficient sliding windows to enable the interior to be kept well aired in summer. Note the ground immediately around it, which is gravel, and thus can be kept free of taint

Dealing with Vermin

It is more troublesome to deal with rats and mice, although they can be trapped or kept down by cats and dogs. My cats—I have half a dozen at present—are allowed free access to the poultry runs from the time they are kittens; and although I do not tempt them in the brooder houses with baby chickens, they do not molest the growers which are on free range. One or other of my dogs is taken around at feeding and egg collecting times, as they have been taught not to molest poultry, although the young Welsh sheep dog delights in setting up partridges and pheasants, and even enjoys startling the mournful lapwing.

With the idea of keeping rats out of these fixed houses it is usual to make the floors of wood, well tarred underneath, or of concrete; but once the rodents take a fancy to a house they become very troublesome. For this reason some poultry-farmers who adopt the semi-intensive system build their houses on piles, 2 ft. to 3 ft. from the ground; but this adds very considerably to the cost of the buildings, while they have to be surrounded by wire-netting to prevent fowls getting under the floors. By far the better plan is to trench around the house, 1 ft. deep by two spades wide, so that 1 in. mesh wire-netting can be sunk down and outwards at right angles, and about 1 ft. up the sides and ends of the house, filling the trench with rubble and broken glass mixed with the earth. It keeps rats out, saves the expense of wood or concrete and prevents the rodents burrowing under the floor.

One of the greatest objections there can be to these modern laying houses—which, as I have shown, are permanent buildings—is that some difficulty may be experienced in keeping the ground immediately surrounding them under grass. By the use of alternate

runs of sufficient size, however, there is no reason why the turf should not be kept in good condition for a great many years. It is a plan I have frequently adopted with success, and is now being carried out on a section of the farm. If eventually the land should show signs of getting foul it will not be a difficult matter to have it ploughed up and re-sown. On the other hand, where alternate runs have not been available I have seen the turf taken up for a yard or so around the house and gravel put down, thus making a reasonably hard surface that can be washed by rain, or periodically cleaned by the use of a besom, which latter is a light task.

It remains, though, that these modern laying houses are very popular with those who specialize in egg production; and as long as they can be employed with such excellent results as are now obtainable by their use under ordinary semi-intensive methods, I cannot imagine that commercial egg-farmers are likely to scrap them for replacement by any form of portable house or folding system, undoubtedly good in certain circumstances as are these latter. The great value of the laying house is its adaptability for practically any situation; and it is certainly the only form of housing to adopt for exposed positions. It is not of mushroom growth; it took years to evolve and bring to its present state of perfection. Hence it is likely to continue as the ideal way of housing laying stock on the semi-intensive system.

Solid *versus* Slatted and Wire-netting Floors

When change is made in an established practice by the introduction of something new, it is invariably found that both the old order of things and the new have their advocates who claim that their method is the only correct one. It is so in the keeping of poultry. It took poultry-keepers many years to realize that Nature's ways are not the best to follow to obtain such results as are now desired from the domestic hen. It is fully acknowledged by poultry authorities that fowls which are allowed free range all through the year, sleeping in the trees during the greater part of it, and finding most of their food in the fields, are extremely hardy birds with cast-iron constitutions; but, unfortunately, they are very indifferent layers. We know that, even while so roughing it, they will respond to good food and regular feeding by producing an increased quantity of eggs. We have discovered, also, that by providing them with adequate accommodation throughout late autumn and winter they will be induced to commence laying many weeks ahead of their natural season for egg production. Admittedly, breeding and feeding have had much to do with the progress which has been made in this direction; but there can be no doubt that housing has played a most important part in it, since without proper accommodation it is hardly possible to get the maximum of production from pullets and hens during winter.

Experienced poultrymen are aware that warmth and dryness are likely to promote out-of-season production; hence to ensure such conditions the birds must be sheltered from bitter winds, snow, and rain. It is for this reason that the scratching-shed house came into vogue, and from it was evolved the modern laying house. Not only do such quarters provide a reasonable amount of warmth and dryness, but, the floor being littered and the grain ration scattered over it, the birds get extra warmth by the gentle exercise of "scratching around" in search of food, as is their wont when enjoying their freedom. There can be no doubt that in some parts of the country such accommodation is most beneficial for winter production, while there are times when it is well-nigh essential for the birds' welfare. Fowls cannot exercise in snow, while if they are not encouraged to use their sleeping quarters during heavy rain or biting winds they will huddle together under whatever shelter their range affords. Advocates of the more recent slatted or wire-netting floor are prone to assert that the solid floor is a most insanitary affair, while the scratching-shed type of house prevents the birds living in fresh air. But there is no reason why this should be so; and when it is, it simply indicates that from idleness or ignorance the stock is mismanaged—the litter is not renewed or the house is badly ventilated.

Objections to Perches

It has been said, also, that the modern laying house with its windows tends to keep the birds unduly coddled and thereby rendered ready victims to summer and autumn colds and similar troubles. It is not so, however, when the house is properly ventilated and its management is understood. Even if the whole front of it were made of glass—which is a style I certainly do not advocate—it should not be impossible in hot weather to keep the interior reasonably cool by shading the glass and opening up the windows and door. But with such lights as I have mentioned in connexion with the houses described above, there is no fear of coddling the birds when due attention is paid to them. It may be as well to remark that the windows of the fowl house should be kept as clean as those of our own dwellings, if we desire our birds to benefit. This is particularly necessary in winter so that the fowls, which may have to be confined to their house, will enjoy the sun. One of the objections to the modern laying house by advocates of the open floor system is that, perch room having to be reduced to the minimum—it is customary to allow 1 ft. a head

for male birds and 8 in. each for hens and pullets—to ensure plenty of floor room for exercise, the fowls are unduly crowded at night.

This does not matter, perhaps, in winter, because fowls on slatted or wire floors will huddle up as closely as possible when sleeping in cold weather. But, whereas they can spread out over the open floor in summer, the perches prevent fowls doing so; hence in these latter circumstances they suffer from overheating. It may be so; and yet such an instance has never come under my observation.

In addition to this objection I once saw it stated —evidently by a person of very small experience— that perching leads to constant bickering among the birds and fighting for favourite places. With this statement, nevertheless, I do not agree; in fact I say without fear of contradiction that there is as much or as little trouble in this direction among fowls which sleep on slats or wire as there is among the users of perches. I am keeping birds in both types of house.

The chief advantage of the open floor over the perch is that it permits of more stock being "roosted" in less space. It is a question of economy, but always providing the acreage is available. With a shortage of room the slatted floor or wire floor house is useless, and the other system is the only alternative. It is a great mistake to imagine that the introduction of these open floor houses has increased the normal quota of birds per acre. As it is, the reverse is the case —more birds per acre can be kept by the use of modern laying houses.

Suggested Cause of Breast Blisters

Before leaving this subject of slatted floors I feel it necessary to draw attention to an objection which was raised against their use from a scientist's point of view, that this type of floor prevents the natural act of perching. In a letter to the technical press, he pointed out that the width of the slats themselves and their close proximity to each other "do not allow birds to obtain that natural grip with the toes which is so necessary for correct perching. The consequential results," he declared, "are that birds sit on the slats, and this has allowed at least two abnormalities to occur: (1) The breastbone rests on the slats; this is followed by irritation and in some cases by breast blisters; (2) the posterior aspect (back) of the hock, when a bird is in the sitting instead of perching position, also rests on the slats, and bruising with thickening of the shin and associated deeper strictures follows. It is not impossible that the recent development of fowl paralysis is in part related to degeneration of the leg nerves, due to the failure of birds concerning their natural perching activities. It would also appear that certain foot conditions, allied to bumblefoot, are in part due to improper perching following the use of slatted and wire floors."

It was suggested by him, therefore, that manufacturers of slatted floor houses should endeavour to construct slats which allow of natural perching. If, however, this were carried out it would result in the slats being almost 1 ft. from each other for adult stock, which would defeat the purpose of the slatted floor and would, moreover, prevent the fowls spreading out or sleeping closely together, according to the weather. In addition to this, the spaces between the slats would in all probability cause trouble among the birds when going to roost, because owing to the low pitch of the roof they would not go right into the house, as they do when the ordinary slatted floor is in use, but would huddle close to the door. As it is, with the slats made as I describe when dealing with the Sussex night ark early in this chapter, there is much less likelihood of fowls developing crooked breastbones and suffering from bumblefoot than when the orthodox perches are in vogue. For many years now I have kept adult stock, as well as chickens and growers, in slatted floor houses, as in other types mentioned; but so far it has not been my experience that this form of house predisposes the birds to degeneration of the leg nerves, to breast blisters or callosities, or to enlarged or bruised hocks.

Mine is not an isolated experience by any means, because slatted floor houses (in the form of Sussex night arks) have been successfully used for hundreds of years by raisers of table poultry and by thousands of poultry-keepers. There is not the least doubt that birds so housed keep in splendid health and condition, granted they are the progeny of sound stock. When discussing this subject recently with Mr. Paynter—the pioneer of slatted floor houses for adult fowls—he suggested that it might meet the case if perches were put over the slats. However, as this would, in my view, lead to some birds perching and others sleeping on the slats in close proximity to them, with results that can be imagined, I do not agree with that view.

What Intensivism Means

As I have remarked in the preceding chapter, when considering the question of accommodation for fowls, practical poultry specialists are aware of, broadly, three systems under which the birds can be kept, viz. on free range, semi-intensively, and intensively. Having dealt fully with the first two, let us consider the last. In few words the intensive system means keeping fowls in a house only, without any outside run; it is, therefore, a question of housing. In the accepted "poultryological" sense it differs from garden poultry-keeping because, in the latter case, the birds are invariably provided with a wired run, either open

or roofed, in addition to their roosting quarters. It thus follows that those who keep hens in such confined places are not necessarily "intensivists." At any rate, that is what is now fully understood by poultry authorities.

The intensive system, under its present title, was introduced about thirty years ago from the American continent; but, while it was successful there, the mistake was made in adopting it in our country in its original form as a great commercial proposition. Until it had been very considerably experimented with, therefore, and altered in many of its details, it proved a failure. Now, however, by having adjusted matters to suit our climate, it has been proved to possess sufficient advantages to commend its adoption as one method of keeping fowls successfully.

Practically anyone can go in for intensive poultry-keeping; but its strongest appeal will be to residents in suburban and outlying districts of large towns, who imagine they lack the room for live-stock. There must be thousands so placed, with no more space than a garden which is given over to flowers; but they can certainly keep a few hens without the least fear of the birds being unhappy or of their causing any annoyance to neighbours. The intensive system ensures healthy stock, because the fowls are so closely confined that they must be housed under scrupulously clean conditions to thrive. They are always under their owner's eye, as it were, and can, therefore, be readily inspected so that if perchance one should catch a cold it can be removed before the trouble, if contagious, has had any chance of spreading. It is also an easy matter to collect the eggs while they are strictly new-laid, because there is not the least possibility of a hen stealing her nest or of an egg being laid in some out-of-the-way place. Then, too, should a hen become broody, she can be dealt with in her first stage and soon brought into lay again.

Not Advisable for Large Flocks

That this style of poultry-keeping has met with opposition cannot be denied, but that it will continue to flourish and be a means of increasing egg production in this country is equally true. I have proved to my satisfaction, as have hundreds of others, that it is possible to keep laying fowls successfully and contentedly in very limited quarters. I do not for a moment suggest that any of my readers should develop intensive poultry-keeping on such a scale as the "double-deck hennery" system that flourishes in some parts of America, where 3000 and more layers are so housed. That it has been attempted on commercial lines in this country I am fully aware; and yet I do not know of one large and completely successful farm where fowls are always so kept.

I recall a visit I once paid to an intensivist who had installed a score of such houses on a small-holding. But, whereas he had been most successful with a single unit of hens which he managed in his spare hours, he could not make it yield sufficient profit on the large scale to enable him to get a livelihood therefrom. At any rate, he told me that after a two years' trial the results from his venture were not up to his expectations, which, perhaps, was not surprising, because he had made the mistake, so common with beginners, of imagining that the actual profits of a small hobby

FIG. 56. A LARGE-UNIT LAYING HOUSE

This centre-span house, on 2 ft. piles, is amply provided with windows; hence it answers well for intensive purposes when fowls have to be confined to it. The birds depicted are Light Sussex, and form one of the flocks of layers on a Bristol poultry farm

—against which labour and rent were not charged—would be multiplied *pro rata* when that hobby was changed into a business.

No doubt of recent times many of the problems confronting early intensivists have been solved; but commercial egg-farmers with whom I come into contact prefer to continue with the older semi-intensive and extensive methods of housing laying stock. In this matter they show their wisdom, because, successful as it has proved on a small scale, intensive poultry-keeping has not yet been found generally suitable for use by poultry-farmers. It makes its strongest appeal to novices; and, candidly, it is best carried out on amateur lines, because on a large scale it has its own difficulties and calls for particularly careful and thoughtful management. Therefore, when sufficient land is available, the semi-intensive and extensive methods prove more successful; hence intensivism is best undertaken in the back garden. When first introduced to this country, some years before the War, it was in the form of what many of us considered little better than a shipping coop. At any rate, the birds had an extremely limited area in which to exercise; and yet they got plenty of fresh air and direct sunlight.

Very Early Models

I was recently looking over some designs of early intensive "plants," and among them were houses with two floors, the ground floor allowing about 2 sq. ft. a head with roosting quarters above, and the overall height little more than 2 ft. One may wonder, perhaps, how fowls could be kept successfully under such conditions; but I know from experience that they were so kept, although it meant constant attention to details. However, improvements have certainly been made in the matter of intensive housing, the span roof and floor lights being among them; and while there may still be some few intensivists who favour the 4 ft. high house with flat movable roof for use in summer, the vast majority recognize that a house which can be entered by the attendant, and one that permits of more ground space for the occupants, is a decided advantage. For these reasons, therefore, the intensive house is seldom less than 6 ft. high in some part, and of an area that allows at least 3 sq. ft. of floor space for each hen.

The type of house required for this system should be roomy, while practically outdoor conditions should be available whenever desired. There must be plenty of light; and the ventilation must be so arranged that the atmosphere shall be always fresh, but without draughts on the birds while they are sleeping. The house should be made to open up back and front, so that when the weather permits of it the birds can get all the fresh air they require. A building of this kind I once saw was so made that, throughout summer, the whole of the sides and ends could be taken off, the only solid part of it at such times being the roof. It was, however, especially well placed as regards shade, because it backed on to a stout oak fence, while a couple of yards or so in front of it there was a well-clipped 6 ft. high privet hedge.

There is no need, though, to make such an elaborate structure—it was fitted all round with wire-netting—since one of the modern laying houses already described could very easily be utilized for the purpose. It would have to be of the type which has floor windows at back and front, and drop-in windows under the front eaves, these latter being made to lift right out. The bottom windows, too, should be casement made and hinged at the top, so that, when open, they would prevent rain entering the house. As can be imagined, also, the front part of the roof should be carried well out, because the floor litter must be kept dry. All open spaces must be so protected that during stormy weather rain cannot be driven into the house.

Ensuring a Dry Floor

This is a most important point in the intensive system. Wet driven into the front or back will make the whole floor damp. The decomposition of the excreta, with their consequent noxious odour, is accelerated by moisture; and a damp "bed" retains the poisonous products much more than a dry one will do. For this reason, then, the floor windows should be hinged at the top and not be made to slide out. Carrying the roof well out should protect the top window spaces; but since light is essential I invented what I term a "weather-board," which is fitted along the front immediately under the eaves and forms a hood or a bonnet. Many years ago and long before any of us thought of the fresh-air system in connexion with poultry-keeping, I used this form of protection for doors and windows for my dwelling house—and for almost any opening where it was necessary to admit air and exclude rain. I was the first to apply it to poultry houses; and it has been adopted with success by many poultry-keepers since then. To add one to the house is simple for those who know how to use carpenters' tools. This "weather-board"—not to be confounded with timber known as feather-edge or weather-boarding—consists of glass put on a stout wooden framework.

The sides and top edge of the glass are let into grooves, while the lower edge is kept in place by screws driven in about half-way, the glass, of course, resting on them. This hood extends the whole length of the front at the top and stands out 2 ft. or more, according to the height of the movable windows, so that an

ordinary rain can be kept out. Thus fresh air will be admitted at all times. A glass top is best to admit light in winter, while during summer a coat of whitewash should be applied underneath to tone down the glare of the sun. Admittedly, ordinary matching or weather-boards as the continuation of the roof, or a hood made of roofing felt, linoleum, or even sacking over taut wire-netting, would exclude rain; but glass is best to admit light. These hoods give more satisfaction on a span roof with ridge ventilation than on a lean-to house with end ventilation.

FIG. 57. A SPAN-ROOF STOCK HOUSE

This house has ridge ventilation, is divided into seven sections for breeding pens, and contains a food room at one end with a sliding door. The front consists of drop-in windows above fixed lights, outside nest boxes, and trap-doors with ladders for the birds. Each section has its own grass run

A House for Twenty Hens

One of the most successful intensive houses I ever made for a score of hens—and which is still in use for semi-intensive purposes in one of the breeding-pen runs—is hump roofed, three-quarter span as this type is sometimes called, the hump or hip being in front and the slope to the back. It is 10 ft. long by 8 ft. deep; the eaves are 6 ft. from the ground in front and 5 ft. at the back, the peak of the roof being 7 ft. 6 in. high, and the house is fitted with ridge ventilation. The front starts with a range of outside nest boxes (on the ground) 1 ft. 3 in. high, then four 1 ft. high by 1 ft. 6 in. wide casement windows hinged at the top, above them four similar-sized drop-in windows, and finally about 1 ft. of wire-netting topped with a glass hood, the spaces between the glass being of wood. At the back there are floor lights to correspond with those in front, starting 9 in. above the floor and hinged on a level with the inside manure board. I prefer nest boxes to be above the floor for my own convenience when collecting the eggs, and because they are out of the way of the litter; but I made them on the ground as an experiment—it saved me the trouble of fitting them with a bottom on brackets and also effected a slight saving of timber. It necessitates the use of a 9-in. board inside the house to act as a flange for the nests and to keep them reasonably free of floor litter. All openings are protected with 1 in. wire-netting, and the hinged windows are made to open outwards and upwards.

There is no fixed model for the intensive house; and while I certainly prefer it with a span roof, as it helps to keep the place cool and gives much more air space and better ventilation, many are made on the lean-to or drag plan, the slope being downwards to the back. Some, too, are made with semi-open fronts, the open (wire-netting) space being fitted with up and down windows and canvas shutters hinged at the top, of which, however, I do not approve because of the difficulty of adequately ventilating them. There are, also, intensive houses fitted with sliding roofs with the idea of providing the maximum of air in summer; but with floor windows back and front, and such ventilation as I mentioned in the preceding paragraph, I can keep that house quite cool enough for the birds' comfort during a normal summer. When all the windows are open there is a through current

of air, and sufficient of it to prevent stagnation and stuffiness over the perches.

It is a fact known to most poultry authorities that fowls have no sweat glands, but they give off relatively large amounts of vapour in respiration and through the skin. It was found at the Nebraska Experimental Station in connexion with the Department of Agriculture, Ottawa, that maximum egg production in winter was obtained when temperatures were not permitted to fluctuate widely; but as a fowl house temperature of 50° F. was too high to be maintained on most farms in winter without artificial heat, it was suggested that a lower temperature held uniformly would be desirable. In Canada, poultrymen have been successful with artificial heat properly regulated; but it has never been found necessary to heat the laying house in our country. Many years ago this was once attempted at a dairy farm in Middlesex; but it resulted in failure. I should certainly not advise its adoption nowadays, with the vastly improved methods now in vogue for the housing of laying fowls in winter.

Fresh Air Beneficial

To whatever design the house is built allow sufficient depth from front to back to ensure the perches being as far as possible from the front, because the latter is where the fowls will take most of their exercise; and do not average less than the floor space already mentioned. See, too, that fresh air and sunlight are admitted, so that there shall be no stuffy or dark corners. The atmosphere will be fresh and sweet if the ventilation is correct; so it is not necessary, as some authorities suggest, to partition off part of the house for roosting accommodation only—let the birds sleep in the fresh air. Do not use the garden wall or boundary fence as part of the house, because such partitions are often irregularly built and so made that it is impossible to use them as part of a wooden lean-to and yet keep all dry and draught-proof. No doubt if the surface of a wall were cemented and made to form the back of the house it might serve its purpose; but I question if it would be cheaper than wood in the end. A house that slopes towards the back should have a wide eaves and a gutter to carry off the rain water; and this important point is more easily managed with a house which has its own wooden back standing 1 ft. or so from the garden fence.

A very important factor in intensive poultry-keeping is to ensure dryness under foot; there must be a solid floor that will prevent damp rising from the ground, as well as an arrangement whereby rain shall be excluded from the interior. The house is a permanent building; hence one of the first considerations must be a solid floor which will not only exclude damp from below but prevent damp getting into it from above, i.e. from the excrement of the fowls. When the land is one's own there is a wider selection than in the case of a tenant's fixture. Under the former conditions there is the choice of concrete, cement, tarred macadam, and other materials. Digging out the earth for 1 ft. deep and for a space about 1 ft. wider than the house each way, filling in with rubble, then covering with coarse gravel, and finishing with a good layer of asphalt composed of tar, pitch, coarse gravel and lime, makes an excellent floor, if each layer is beaten down firmly.

In the case of a tenant's fixture, however, wood will be practically the only material available. It must be 1 in. floor-boarding, and put on 2 in. by 3 in. quarterings, with enough joists to prevent sagging when the attendant uses the floor. The boards should be well preserved before they are fixed, either by being creosoted or coated with gas tar; and the quartering should be similarly treated. Creosote or some similar preservative should be used on the outside walls; but the parts of the house which rest on the ground, and for 1 ft. up inside and out, should be tarred.

Essential Fitments for Laying Houses

No class of domestic poultry, not even waterfowl, will thrive in a place that is for ever wet; hence the benefit of selecting for the laying house a dry site to begin with, and then keeping it in such a state. The position of the house is as important to the man who goes in for intensive poultry-keeping in his garden as it is to one who is setting up on a large scale. The building should be on the highest part of the land, provided it is not unduly exposed, and on the southern side of a gentle slope, if possible. In any case, its position should be such that, during the season of rain or in heavy storms, it does not stand in a miniature pond. On level ground I should not hesitate to make the floor 1 ft. or more above the surface of the surrounding land. Then again it should be a sufficient distance from other buildings to enable it to get the maximum of sun and fresh air; it must not be in the shade of, or so dwarfed or surrounded by them that it is dingy or "stuffy."

As a rule it should face south, so that it is likely to get the sun. In a bleak district protect it from the north and the east, while in rainy quarters let there be some protection on the south-west. During my residence in a certain part of the Buckinghamshire hills I found that the worst rain storms invariably came from a south-western direction; so much so that it was always best to have the actual front of the laying house towards the south-east. In this matter, however, let each poultry-keeper be guided by the lie of the land. Aim for good drainage at all times and the maximum of sun in winter. With our humid

atmosphere it is perhaps hardly possible to ensure a "bone-dry" house at all seasons of the year; there may be on occasions a certain amount of interior damp by condensation of the air. Nevertheless, if the floor is sound and the ventilation perfect, all should be well.

Early in this chapter I mentioned the timber that

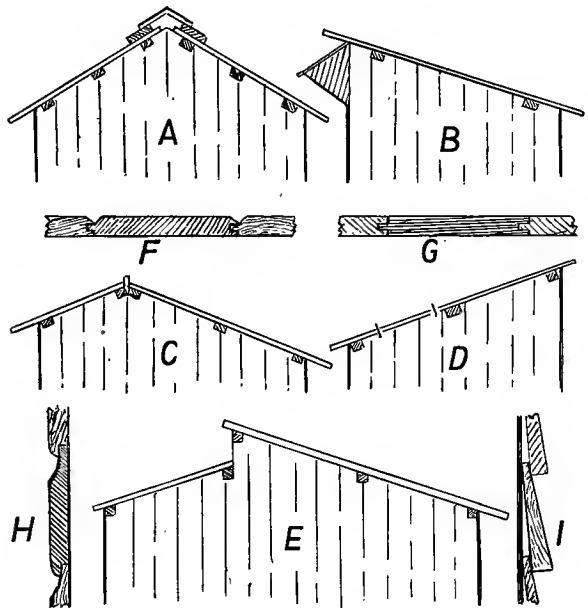


FIG. 58. POULTRY HOUSE ROOFS

A. The span (centre), showing ridge ventilation
B. The Drag or Lean-to, showing "weather-board" in front
C. The two-thirds or three-quarters span, with the front higher than the back; known also as the Hump or Hip roof. When (as in the Tolman house) the front is lower than the back, it is referred to as the Long Slope. This form of span roof is frequently fitted with ridge ventilation
D. Similar to *B*, but the front not as high as the back, and the roof fitted with glass in the lower part
E. Similar to *C*, but with upright windows in the roof
F. Section of toogued, grooved, and V-jointed matchboard, used perpendicularly
G. Section of tongued, grooved, square-edged floor board
H. Section of rebated (rabbeted) or shiplap weather-board
I. Feather-edged weather-board. Weather-boards are used horizontally

should be used. No matter what size the house may be, never have the walls of less thickness than $\frac{3}{4}$ in.; indeed, it will be more economical in the end to have them made of 1 in. material. Cheap houses are built of $\frac{1}{2}$ in. deal; but my experience of such flimsy buildings is that, however low their price, they are dear from the beginning and a constant source of trouble. Tongued and grooved (or match) boarding, put on perpendicularly, answers well for a house in a sheltered position; but where the building has to be fully exposed to keen wind, heavy rain or scorching sun, I find it more serviceable to use feather-edge (or weather) boarding. These boards, which are nailed on horizontally from the bottom, the thin edge being uppermost, readily contract and expand, whereas match-boarding may crack in the tongues and thus cause gaps in the wall which would make the interior decidedly draughty and might thereby lead to colds and kindred ailments among the birds.

All glass windows in the house, including the drop-in or Lancashire ones, must be made to fit properly; they should be loose enough to be readily opened, but not too loose to allow chinks at the sides and top. If necessary, therefore, fit the openings or the windows with flanges or felt. Should a casement at any time stick, apply a little old-fashioned black lead, which is preferable to grease. The attendant's door, whether made to swing on hinges or hung to slide by grooved wheels at the top, must also be made to shut tightly, so that when it is closed all draughts will be excluded. I always fit inside flanges to the door spaces, because when flanges are on the outside, on the door itself, they are very apt to hold the rain. In addition to these flanges I fix a 9-in. board inside at the bottom to keep the litter in place—one gets accustomed to it after stumbling over it once or twice. Each house, too, and particularly when used for intensive purposes, should have a wire-netting door for hot weather; do not secure it with hinges but make it to be lifted on and off (against the flanges), and keep it in place with top and bottom buttons. A hood to it will be found very serviceable.

Formulae for Whitewash

Many fowl houses are lime-washed, and two good formulae (for either interior or exterior work) are as follows—

1. To each peck of rock lime, while in the process of slaking, add one pint of raw linseed oil, and after the lime has become thoroughly dissolved reduce (with boiling water) to the proper consistency and add 1 lb. of rock salt.

2. To each peck of lime, after mixing to the proper consistency, add size or glue water (1 lb. of good quality ground glue thoroughly dissolved so that it will not set, and mixed into the wash) and 1 lb. of rock salt.

Others for inside use are as follows—

(*a*) To each peck of lime, slaked and thinned (as above) add 1 lb. of rock salt, $\frac{1}{2}$ lb. glue (dissolved as above), and just a little "blueing," which will clear or whiten the wash.

(*b*) To each peck of lime, slaked and thinned, add $\frac{1}{2}$ peck of salt, 1$\frac{1}{2}$ lb. ground rice (boiled to a thin paste and stirred in while hot), 4 oz. Spanish whiting, and $\frac{1}{2}$ lb. glue as previously mentioned.

(*c*) To each peck of lime (as above) add $\frac{1}{2}$ lb. common salt and 1 lb. sulphate of zinc, which in a few days' time will cause the whitewash to harden on the woodwork.

In some cases a brilliant white is too glaring, hence

the wash can be toned down. Copperas will change it to yellow; the addition of 1½ lb. yellow ochre (to the peck of lime) will make it a cream shade; 2 lb. burnt umber and ½ lb. each of Indian red and lamp black, will result in fawn; while for grey use 2 lb. raw umber and 1 lb. lamp black. The colour does not show until the wash has become thoroughly well dried.

Limewash can be applied with an ordinary limewash brush, but to be effective it must be done quickly and evenly. It is best put on hot; hence if there is much surface to cover I prefer a continuous hand sprayer to a brush. For the first use (for surfaces exposed to the weather) give two coats. Prepare the wash in a clean vessel which will hold water; and slake the lime by pouring over it sufficient boiling water to cover it 4 in. to 5 in. deep, stirring it until slaked. When quite ready mix with it enough water to bring it to the consistency of thick cream. Always choose a dry and bright day for limewashing.

Tar for Roofs

It is customary to cover the roof of the poultry house with specially prepared felt. In some instances, however, plain weather-boards are used, and in this case it is advisable to preserve them with tar. For this purpose, and, too, for the sides of the house, a good mixture is as follows: Heat 1 gallon of gas tar in an iron pot or a stout galvanized pail in the open air. When it is warm add 4 oz. of Russian tallow and stir it well in. Then take the tar off the fire—this is very important—and add 1½ pints of naphtha. Mix well and apply hot with a tar brush. The addition of a little red ochre to the above mixture turns it to a chocolate colour, which is by many people preferred to black for coating the outside walls. Another excellent way of preserving plain roofs is to give them a coat of gas tar, and when dry a dressing of 1 gallon of tar, 4 lb. lime, and 2 lb. pitch, all boiled together and applied hot. It makes a splendid surface; and a coat of tar applied every third year will keep it in sound condition. It is also as well to sprinkle the roof with sand before the tar sets, as it hardens the surface and prevents running during hot weather.

Internal Fitments

The internal fitments of the laying house should be, wherever possible, well above the floor, so that they can be kept free of the litter which is turned over by the birds. This is particularly important when keeping fowls on the intensive system, because in such circumstances the whole floor space should be available for exercise. The fitments include nests, perches, and vessels for food and water.

Although it cannot be said to be absolutely essential to provide hens and pullets with nest boxes, it must be admitted that to do so induces the birds to deposit their eggs in one place rather than to lay them at random on the floor or on the manure board, where they will certainly become soiled and probably get broken. Some poultry-keepers are evidently under the impression that the nest must be made in a dark place where the hen can conceal herself while she is laying. No doubt this seclusion is strictly in accordance with nature; in a wild or semi-wild state the bird selects such a spot, but simply so that her eggs are out of sight of her natural enemies. However, in the matter of nests for the modern laying hen I

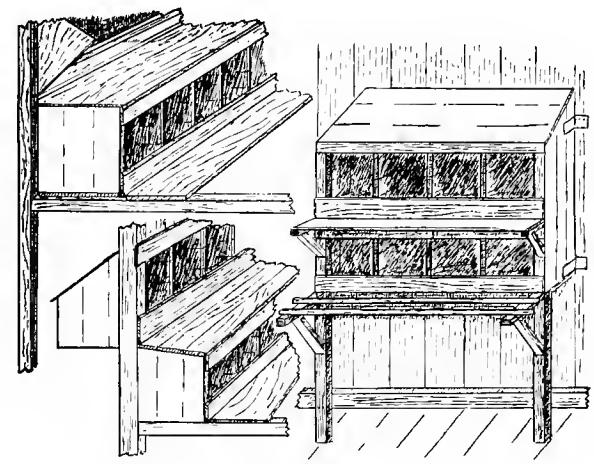


FIG. 59. NESTS

Left, top. Inside, at the front of the house under the drop-in window. When such nests are in use it is advisable to fix wire-netting to prevent fowls sleeping on top
Left, bottom. Outside and inside, at the side of the house opposite the attendant's door
Right. A set of eight. Such nests are handy to fix against partitions in large-unit houses

study my own convenience, as with a little persuasion she will generally lay in any given spot as long as it is comfortable.

Both inside and outside nests are to be seen on my houses, but I decidedly prefer the former, although, admittedly, outside nests are used in connexion with the Sussex night ark, as I have already explained. Nest boxes which are attached to the house outside and are reached by the hens from inside—whether those nests are on the ground or not—must be very carefully fitted to prevent draughts. Even when they can be opened from the back by means of a drop flap, the attendant who is collecting eggs is apt to frighten birds which are laying, while if he were to open the flap during rain the nest material would probably get wet.

Inside Nest Boxes

Inside nest boxes are preferable. The use of them means that the house must be entered each time an

egg-round is made; hence the attendant, if he is trap-nesting, can enter up the cards as soon as he takes up each egg. Moreover, it enables him to keep an eye on things; fowls generally retire to their house when they are off colour, and it is then an easy matter to

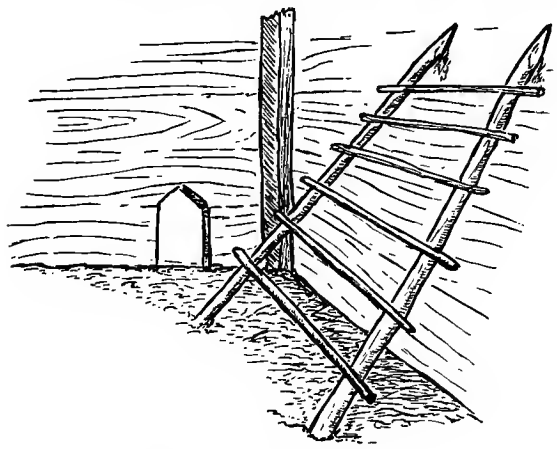


FIG. 60. A LADDER PERCH

Although the ladder perch is generally condemned as unhealthy, it is still in use in several parts of the country. The one from which the above sketch was made is to be seen in a hen house I recently saw on a farm. It accommodates from twenty to thirty birds as night quarters in an old shed; those I saw were certainly healthy and sturdy and none the worse for being so roosted

catch them up for treatment. There is little fear of exciting the birds by his entering the house—if he understands his hens, as an old hand at the game always does—because layers almost invariably face the front of their nest and can be readily approached. I generally make my inside nests in single tier, in rows of six, and I fix them on legs 2 ft. to 2 ft. 6 in. above the floor. Each is 1 ft. to 1 ft. 3 in. square; the height in front is 1 ft. 3 in. and at the back 2 ft. 3 in., which is necessary to give the top a sharp slope and thus prevent any bird roosting thereon. It must have a top, otherwise some fowls will be tempted to perch on the partitions.

To keep the nest material in place there is a front flange about 6 in. high at the bottom, while to enable the birds to reach the nests with ease each row has a couple of 1-in. square bevelled perches, 4 in. from the nests and each other, or a flat 2 in. by 1 in. perch in front. This is much better than forcing the hen to jump into her nest; let her walk in and out, and fly to and from the perch when she wants to lay. If the fowls are being trap-nested it is generally advisable to have the nest boxes in two or three tiers, because each layer has to be released before another can use the same nest. Otherwise half a dozen nests will probably be more than ample for a score or two of hens, since they seldom all want to lay at the same time, and many will use the same nest. The boxes should be fixed in a place most convenient for the attendant, either with their fronts to the light (at the gable end of the house) or the reverse way under the drop-in windows. It matters little, as long as they are accessible to the birds. I use chaff, chopped straw, or sawdust as the nesting material, but never hay, which harbours mites, or long straw, which seems to annoy some birds. I like to study their comfort as much as possible; it keeps them tame, and that means much when dealing with layers.

Arranging the Perches

The custom in this country is to arrange the perches lengthwise, from end to end, and on the same level at the back of the laying house. The number varies from one to half a dozen or more, but seldom do I exceed two, simply because it is not an easy matter to handle birds on the back row when there are more than two roosts. The old-fashioned ladder perch is still in use at some farms, but, for obvious reasons, it is a decidedly insanitary arrangement, while it almost invariably results in the top perch being much overcrowded, because most of the fowls crush on to it. No matter how many perches are required they should be on a level. When arranging them the first should be about 1 ft. from the back of the house, and the other—I find two ample—1½ ft. from it. When, however, more than a score of fowls have to sleep on one perch, there should be divisions every 10 ft. or so to

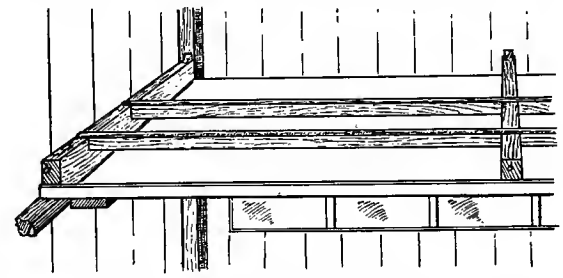


FIG. 61. LONG PERCHES

A section of a fowl house showing one end of the long perches (two) over the droppings' board and, below the latter, the floor lights. The perches shown above are fitted into 4 in. by 1½ in. end and centre supports which are hinged at the back, thus enabling them to be slung to facilitate the cleaning of the droppings' board

prevent overcrowding, the partitions (of wood) extending from floor to ceiling, and at least 3 ft. deep.

For most breeds 8 in. of perch is ample for each hen or pullet—three birds to 2 ft. of roost—but 1 ft. is generally allowed for an adult cock, as in breeding pens. The poles, about 2 in. diameter, less rather than more, may be round or square—the latter with the top edges well bevelled—and the ends of them dropped into sockets, so that they can be readily taken out for cleaning. They should be about 2½ ft. from the floor; and, although fowls may like perching in trees and

swaying with the wind, the house perch should be steady and without a sag—an unsteady roost prevents the birds settling down, while one that gives in the middle causes the fowls to pack too closely together. Long perches should be supported every 5 ft. or so to keep them rigid.

In some large laying houses the perches are short and fixed at right angles to the back. My attention was first drawn to this form of perch twenty years ago. The poultry-farmer who had installed it did so because he considered it a great mistake to have long perches fixed from end to end of the house. As he remarked, "There may be forty to fifty birds in a row overheating themselves and causing great discomfort and restlessness. It is the tendency of long lines of roosting fowls to huddle together. If a hen rises the two on each side close up, and when she sits down again she has partly to sit on those below." In his houses the perches were 4 ft. 2 in. long, 2 ft. from the floor and placed at right angles to the back of the house, so that not more than six hens could sit on one perch. It is true that fowls will crowd together on long perches; hence the divisions I have just suggested. Short perches add to the initial expense in fixing, and, moreover, they take up more room than a couple of long ones, while I have not found them in any way advantageous. What I do find beneficial in a low-pitched ark-shaped house I have in use—it was originally a shed for a couple of motor bicycles—is a slatted platform instead of perches. It is 2 ft. wide by 6 ft. long and makes a comfortable resting place for a score of light-breed hens.

Manure Boards

The whole floor of the laying house should be available for exercising purposes, and particularly when it is an intensive house; and it is essential to keep the scratching litter reasonably clean. The night excrement from fowls, which is considerable, should not be allowed to foul the floor; and for this reason there should be a manure board running the whole length of the perches or the slatted platform, and about 3 in. below them. This can be made of match-boarding, with the reverse side up and the surface smooth; it should be tarred for preference, but at any rate so treated that manure cannot soak into the wood.

The match-boarding requires stout battens underneath, at the ends and every 3 ft. or so, to bind them into one piece. For a single perch (fixed 1 ft. from the back of the house) this manure board should be 1 ft. 8 in. wide, and for a double row of perches, 3 ft. to 3 ft. 6 in. wide, according to the distance between the roosting poles. The back and the ends must fit closely to the walls of the house, while along the front of it there must be a flange, about 2 in. high to keep the litter—sawdust, or granulated peat moss, but never ashes—in place. The board should rest on battens at each end and have upright supports under it to prevent sagging. Some poultry-keepers remove the excrement daily; but if the house is well ventilated twice or thrice a month will be frequent enough, when the litter should be shaken over. It will probably want renewing monthly.

At one time I was rather keen on having a manure "pit" instead of a board under the perches. I got the idea when visiting a poultry-farmer in Sussex; and it appealed to me because, a few weeks previously, I had unfortunately lost a valuable young stock cock who had struck his head against the board while exercising in the house. The one I saw, at least its type—each large laying house on that farm was so fitted—was made by the manure board being stood on edge on the floor in front of the perches, so that with the back of the house a trough was formed, the object being to keep the excrement as far as possible from the birds while they were roosting. I adopted it but found that some of my fowls used the top as their perch. I then modified it and had a 9-in. creosoted weather-board placed on edge about 2 ft. from the back of the house under the single perch. This pit was loosely littered with earth, ash, or sawdust, whichever was handy; and the manure, raked over once weekly, was removed every month or two.

This was, perhaps, a slipshod method; but as the house was well ventilated no unpleasing odour emanated from the pit. Granted it reduced the scratching space of the floor, although the occupants of the house appeared to have plenty of room in which to exercise when they had to be fed inside. However, I eventually did away with the pit and put in manure boards, horizontally. Much is to be said in their favour when fowls are restricted to their houses; but the time and labour involved in cleaning the boards on a poultry farm are serious items. They cannot, though, be abolished, because it would never do to allow all the manure to mingle with the litter, which would have a prejudicial effect on the health of the birds.

Mash Troughs and Hoppers

Soft food given to fowls should be put into troughs, and on no account should wet mash be dumped on the ground or spread broadcast, not even for free-range poultry. Except for intensively kept fowls, however, or during very wet weather, this form of mash is generally given outside; and if the mixture is broken up sufficiently to prevent the birds having to drag out large pieces and themselves separate it on the ground they will get their food in a clean condition. The mash trough should be long enough

to enable the whole of the fowls to get their food in comfort and without any of them fighting for a front place. If it is made V-shaped, not too deep, and fairly broad across the top, every particle of food can be reached with ease. I find that a 5-ft. long trough,

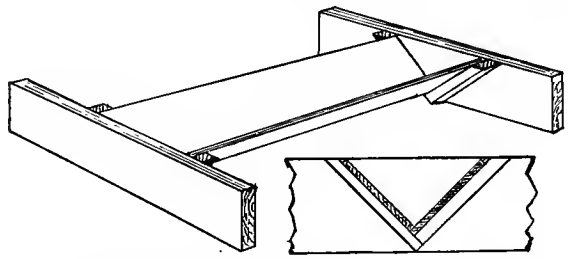


FIG. 62. A TROUGH FOR WET MASH

The trough should be made of stout timber and screwed securely to long and heavy ends, to minimize the risk of its being upset when in use. If V-shaped, wide spread at the top and fairly shallow, it will permit of the birds getting the food with ease

with 6 in. sides, about 9 in. across the top, and with end pieces of heavy wood 1 ft. 6 in. long—to prevent its being upset—is suitable for a score of hens. The trough must be put on the floor of the intensive house, but it should be removed and hung on a nail as soon as the birds have eaten the food.

Dry mash hoppers, unless specially designed for outdoor use, should be hung inside the house, fixed to a convenient part of the wall about 2 ft. to 3 ft.

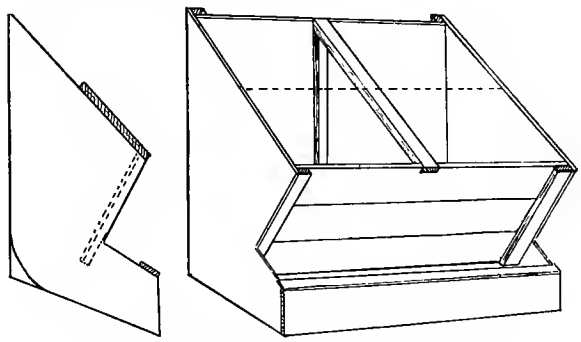


FIG. 63. A HOPPER-TROUGH FOR DRY MASH

A simply-made dry mash hopper—with the entire top removed—is shown above, on the right. It is intended to be hung flat against the wall of the fowl house, so that dry mash will always be available from the front, the trough. This latter is fitted with a lip to minimize wastage when birds are feeding from it. The sectional view (left) gives an excellent idea of the end, the dotted lines indicating where the front is fixed; the curve at the bottom (inside) is formed of tin. The abrupt slope of the top is advisable, to prevent fowls roosting on it

up, and fitted with a platform or perches similar to the nest boxes. These appliances are of various designs, but even the best of them does not prevent a bird wasting some food by hooking it out with its beak. As a rule, however, fowls eat freely from dry mash hopper troughs when they get accustomed to this form of food; and quite baby chicks will do so, although their troughs are not fitted with hoppers, but guards. These appliances can be made by anyone handy with tools, but their cost is so small that I prefer to buy them. The chief point is to see that the meal drops easily into the trough. Before refilling the hopper the residue of mash in it should each time be tipped, one week to the left and the next week to the right, for the purpose of ensuring that the oldest food is periodically eaten. If, owing to damp weather, the meal is inclined to bind, it must be loosened with a stick. It is advisable that the hopper should not be more than about three-quarters filled with mash.

Vegetables and Water

Fresh green food is an essential part in the feeding of intensive fowls; and it must be supplied in a clean

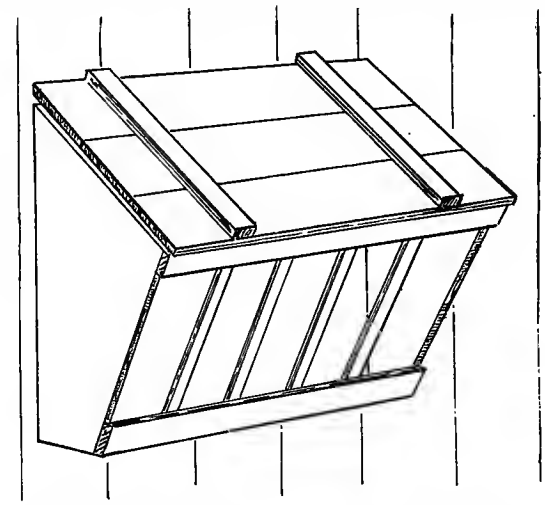


FIG. 64. A RACK FOR GREEN FOOD

When fresh green food cannot be tied securely for fowls to pick at, it can be put into a rack, as depicted above. The bars need be only 2 in. to 3 in. apart. A lid will prevent birds perching on its edges. It should be hung about 1½ ft. from the ground

state. There are poultry-keepers who throw it loosely on the floor of the house, in which case not only does it look untidy, but it soon gets contaminated. Others put it into a rack hung 1 ft. from the floor. I used to do so; but if greens cannot be strung securely in a bunch against one of the wire-netting floor windows, put them into a string bag about 1 ft. up, or chop them finely and put them into the mash trough. A grit and shell box is a handy contrivance for the intensive house, although many feeders nowadays scatter a handful or two of shell-forming material with the grain ration once a week if the fowls cannot find any on their range—I let my birds have a small quantity perhaps once a month and do not keep it constantly before them. However, when layers are being housed strictly on the intensive system it is customary to have a grit box within their reach.

It is necessary to their existence that layers have clean water to drink, and plenty of it. They seem to prefer to drink from ground level; hence in the ordinary way their troughs are put on the ground. In the intensive house, however, this results in the water soon getting dirty with the litter that is scratched up. It is so, even when the drinking vessel is placed on a platform a few inches above the floor. For this reason, therefore, to ensure the water being kept clean all through the day, I originated the idea, many years ago, of putting the trough in an outside box but available from the inside. It can be made on either end (or side) of the house, but, of course, not under the manure board. It should be about 2 ft. from the top of the litter, with a 9-in. wide platform to enable the fowls to stand and drink with ease. The water vessel must be on a solid platform, and bars must be secured, perpendicularly across the front, 3 in. apart, to prevent the birds getting into the water.

Cut out, from the end of the house a space 1 ft. 6 in. high and long enough to take the trough; and protect it from sun and rain by any suitable contrivance. The one I sketched at the time, from the idea I had carried out on an intensive house, was similar to a nest box, the dimensions of it being 2 ft. 6 in. long by 1 ft. 9 in. high (where it fitted the open space of the house), 8 in. deep and 8 in. high at the back. The top was made in the form of a hinged lid so that, from outside the house, I could easily reach the trough for cleaning and refilling. My fowls soon got accustomed to it. Perhaps it may be as well to mention that rain-water from slate, tile, or wooden roof is quite wholesome for adult stock if it is caught in a clean barrel or tank, on the bottom of which there is a 2-in. layer of lime. This makes the water hard, but in such a state it is beneficial rather than otherwise for layers.

Suitable Floor Litter

Last, but by no means least, of the essential fitments for the laying house is the litter, which is more important to intensivists than to those whose poultry have an outside run, because if it is not suitable then the fowls will suffer from lack of exercise.

In my time I have experimented with different kinds of litter. Coarse sawdust, cedar waste, short shavings, cavings, and garden mould put through a riddle to remove any large stones, are all suitable; the first three are dry and give off a pleasant odour. No doubt hay appeals to some poultry-keepers; but, as scratching material, it is most objectionable, not only because it so quickly becomes matted, but it is an ideal resting place for fowl parasites. Even when put through the cutter and made into chaff it is unsuitable; it is too light, it is not a hygienic litter, and, moreover, fowls are apt to eat it and suffer from crop stoppage.

Then, too, straw is very often recommended, either wheat or oat straw; but it is not really beneficial because it does not absorb the manure, while it is detrimental to the health of the fowls if it is mouldy, and if at all weedy, as, for instance, when it contains thistles, it is said to cause foot trouble among the birds. It is better as "chop"; but even then it is almost too light to be serviceable alone. Chopped fern makes useful litter; and the same may be said of autumn leaves, when dead and dry, and especially if they are from oak or beech trees. All light-weight

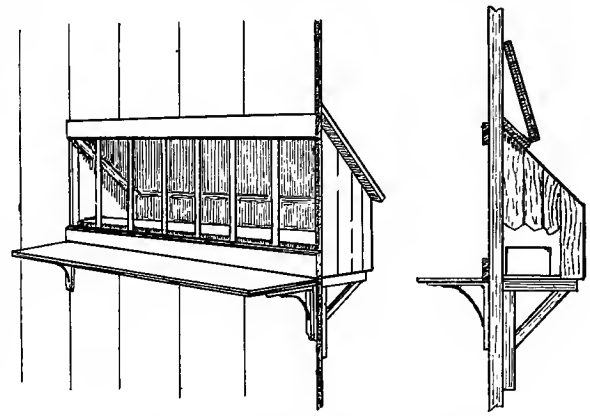


FIG. 65. A BOXED DRINKING TROUGH
On the left the trough and the box are seen from inside the fowl house, while on the right the side view shows the position of the trough, and also the flap of the box open for filling

materials, however, should be mixed with earth, so that the birds can dust in the litter and thus keep their plumage free of parasites.

Prevent the Litter Caking

When litter has to be purchased, I question if peat-moss can be excelled. The granulated kind packed in 2 cwt. bales is preferable to that which is put up in bags, because the latter is too dusty. I have often used the common rough stable peat, but it had to be teazed out, which necessitated manual labour with garden fork and pickaxe. A 2 cwt. bale of it will be ample for 100 sq. ft. of floor space, while such a quantity, with little attention, will last fully twelve months; indeed, I have had it in use for a longer period with satisfactory results.

Some poultry-keepers object to it because it can hold water almost like a sponge; but almost any litter will do so if the floor is damp or rain is allowed to get to it. It must be admitted that at some times of the year it is difficult to keep the litter in laying houses dry. When birds are let out during a spell of wet weather on to runs which are in a more or less

saturated condition, they sometimes bring in, on their feet, enough moisture to make the best litter damp. For this reason it is better to keep the fowls confined to the house for a fairly long period than to allow them out to bring mud into their quarters. Nothing could be less healthy than continued dampness underfoot. However, if they must be liberated let it be late in the morning, so that they will get well away from their house.

Whatever kind of litter is used it should be periodically raked over or shaken up with a garden fork, otherwise it may become caked and be then of little use for the purpose. Occasionally, too, it is beneficial to riddle some of the manure out. The great thing is to keep it dry and to renew it when necessary.

FIG. 66. LAYING BATTERIES
An interior view of one of the single cage laying battery houses on a stock (Essex) farm, where 1000 birds are kept on this system for egg production

Batteries and Cages for Laying Fowls

Before leaving the question of housing the stock I must refer briefly to what has been termed the "cage-bird system" of managing layers. Until quite recent times it was considered that the intensive house, which I have just described, was as far as one could go in keeping fowls successfully when depriving them of contact with the earth. Nowadays, however, we may have to include as intensive the keeping of laying hens in cages; but this is such extreme intensivism that, to distinguish it from the amateur's intensive house which permits of the birds indulging to a certain degree their natural instinct of turning over litter in search of food, I prefer to term it, as do so many others, the battery system for laying hens.

It amounts, in short, to keeping such fowls in single units, each in its own cage, as birds are penned when they are exhibited in competition for prizes, or at auction sales, or sometimes when they—as broody hens—are cooped to bring them into lay again. But whereas the show pen has a solid floor and the broody-hen coop a slatted bottom, and the birds so confined are shut up in them for only a few days at a time, the laying cage has a wire floor sloping to the front, and the inmates are there for the duration. As can be imagined, such very cramped quarters—they permit of little more than the bird turning round—for creatures who enjoy exercise and benefit therefrom, are strongly opposed by many people on sentimental lines. But those who have adopted it—and there are many in this country who are doing so, and some who have done so for five or six years—are too hard-bitten to allow sentiment to interfere with their business of getting the maximum output from layers on what they consider to be the most economical lines.

Moreover, these poultrymen, and they are poultrymen in all that the term implies, are firm in their belief that the only way to ensure layers being absolutely free of disease is to cage each bird separately, to put them in solitary confinement as it were. However, with this I most emphatically disagree, because layers can be and are being kept in absolutely sound health under any of the systems I have already described. That argument in its favour, therefore, can be dismissed without a second thought. That this latest form of battery is imprisonment can be imagined when I state that each bird is cooped in a wired cage, and, as an American authority stated, "there to remain, day after day, and month after month until a falling off in production earns a release that marks her for the butcher." There is not much more than enough room in each cage for a good-sized hen to turn around or flap her wings, and yet the cage, at the most only 1 ft. 6 in. square, is the sole "run" the individual bird has, while even the wire floors of these cages are slightly sloping, an arrangement to enable each egg that is laid to roll automatically out of the bird's reach. And yet, despite such strict confinement, the birds appear to be well; and they can scarcely be unhealthy since production is high as a rule.

High Production Ensured

It is as well to remark that the battery or laying cage for birds was originated in America, and by poultrymen who had considerable experience with other systems which, apparently, had resulted in mortality among layers reaching 25 to 35 or more per cent annually. At first it was the custom to keep the battery birds in units of half a dozen or more; but since that did not considerably reduce the percentage of mortality and, moreover, it led to trouble from cannibalism, feather plucking, and similar "vices," it soon developed into single penning. One

of the largest farms using battery cages in America at that time was in New Jersey, where the cage capacity was for 4700 hens; but this is likely to be exceeded in the near future, since one of the pioneers of the single battery system is planning for 9600 "mature producing layers" to be so kept. That this method has got a footing in Great Britain is evident from the fact that a Scottish poultry-keeper at Annan commenced with it in 1929 and is still continuing, while two Sussex commercial egg-farmers—one at Nunfield and the other at Burwash—have had, respectively, five and four years' experience of it. In addition to this, there are several single cage laying bird batteries now on the market.

It has been suggested in some quarters, happily not in this country, that the battery method is commercialism run riot, and that it will lead to overproduction and to the destruction of the poultry industry, because a writer (in Australia) happened to advise that "backyarders build double-storey battery laying houses capable of holding 2000 layers on a section 48 ft. by 26 ft." However, before such a vision can take tangible form in Great Britain there will have to be a revolution in the laws regarding the keeping of live-stock in closely-populated areas, which is not likely to be in our time. It is possible that the advocates of this system took their cue from the success obtained in the battery brooding of chickens; and in this direction the writer in question said that "on the one hand we are dealing with a small chick which requires food and warmth and not very much exercise or sunlight during the first few weeks of its life, as against a pullet requiring fresh air, sunlight, unlimited exercise and an environment suitable to its physical and mental make-up." This may be so, theoretically; but not what we find in practice, because the caged pullet is simply denied exercise, as sunlight and fresh air must be available.

Admittedly it is a long flight from the hen at free range, roosting in the trees, and laying when and where she will, to the super bred-to-lay pullet, kept in a cage, and laying because she has nothing better to do in the way of exercise. Nevertheless, as fowls can be kept in perfect health under strictly intensive methods, which were looked on with scorn by many poultry authorities when they were first mooted, so it is quite possible to keep laying hens fit on the single pen battery system. It is being handled on commercial lines in this country, but whether it will prove to be the most economical way of producing market eggs remains to be seen. In my opinion success must

FIG. 67. SINGLE CAGE LAYING BATTERIES
A sixteen-bird laying battery (of eight, back to back) which forms a compact unit. A trough of one cage is removed and the gate open to illustrate the easy operation

depend largely on feeding, but very little appears to be known about it, since some advocates suggest an all-mash (dry) ration, while others give dry mash, wet mash, grain and fresh green vegetables to their birds. As the pioneer of the method in this country recently remarked, there are snags in it, none of which, in his opinion, is insurmountable, but he wanted it to be thoroughly understood that the whole idea is very much in the air at present. And there, I think, we may safely leave it for the time being, because I feel sure that the beginner at poultry-keeping, who wishes to be successful with his undertaking, will find any of the housing methods I have described suitable for his purpose.

CHAPTER IV

SELECTING AND MATING STOCK FOWLS

THERE are several ways in which people who contemplate going in for poultry-keeping as a hobby or a business can commence their career; and although the accommodation they have at their disposal will have a bearing on the subject when deciding which is the best one to select, the question of capital will enter into it, while one's aptitude for doing things will also have to be taken into consideration.

I think it will be agreed that those who look upon the keeping of fowls purely as a hobby—and quite a number of people do so even in this commercial age—seldom trouble to count the cost of it. And while it has been said that a hobby is all the more fascinating if it can be made to yield a profit, this does not appear to be the general consensus of opinion among those who breed standard stock. At any rate, if it were not for the pleasure which is to be derived from poultry-keeping, there would be comparatively few fanciers left to patronize the numerous exhibitions of live-stock which are held annually in this country. This much is evident from the fact that it is only a select few of the hundreds of breeders engaged in it who are able to make the showing of poultry a financial success.

Starting with Breeding Pens

However, leaving the exhibition side for the present and viewing the proposition solely from what is generally known as the utility aspect, that is, as a means of producing valuable food-stuffs, the novice has the choice of beginning in a variety of ways. Thus he can commence with eggs for hatching, with day-old chickens, young birds just off brooder heat, half-grown fowls, pullets on the verge of laying, cockerels for the fattening pens, or matured stock from which to breed. Each of these has its advocates as the most promising way in which to make a start; but of them all I am firmly convinced that the last is actually the best. Perhaps I am so firm in my conviction because it was how I began my poultry career many years ago; indeed, no matter whether the egg or the hen was created first, very few if any authorities in my young days advised one to begin except with stock birds when the desire was to gain a sound general knowledge of poultry-keeping. Moreover, my view is strengthened by the fact that at the present day it would appear to be the most satisfactory method to adopt to ensure freedom from certain diseases in the offspring, because one's own breeding stock can be blood-tested.

This subject of selecting stock birds for breeding purposes is one which requires more than a passing thought, because it is, of course, the foundation of the whole business, and on it will depend the success or failure of the undertaking. There are practically two distinct objects for which the utilitarian has to breed, if it is his desire to make the most of his fowls; and they are the production of layers and the breeding of birds suitable for table purposes. Each must be considered separately. It is next to impossible for the breeder who possesses a thoroughly reliable strain of laying stock to produce from it chickens which are fit to satisfy the demand for the best-class table poultry, while he who keeps birds which are mated solely for the production of table fowls cannot possibly ensure the pullets being prolific layers. These two qualities are so much opposed to each other that they can scarcely be combined to perfection in one strain (or family) of poultry.

In making this statement I am not overlooking the fact that there is a class of fowl known as the general-purpose or dual-purpose one, suitable for laying and table use. Nevertheless, useful as such birds undoubtedly are, and especially for crossing, it will be found that when laying strains are formed of any breed so grouped, those strains are practically useless for the production of market chickens, if for no other reason than that the cockerels are deficient in breast meat. This has been very clearly exemplified of recent times in the Sussex fowl, which is unquestionably an ideal bird for the table and widely bred to supply the first grade and, therefore, the highest priced fowl on the market. Some breeders have selected the Light variety of the Sussex for the sole purpose of egg production, but with the almost inevitable result that those laying strains can no longer be depended upon for the supplying of prime table chickens. In a measure, too, the Leghorn has suffered in a similar way, because to such a high degree of fecundity is it now bred that what pretension it possessed to table properties in its early days—it was useful for the milk chicken trade—has disappeared, and the cockerels are no longer saleable for such a purpose.

The General Aspects of Mating

This chapter, however, will deal with the selecting and mating of fowls from the general aspect and not as they affect specified breeds or varieties. In this direction, then, we have to consider both the male

bird and the female; and, as I say, with two distinct objects in view. But for whichever purpose the selection is made it must be for general health, vigour, and stamina, first and foremost. The poultry-keeper, therefore, who decides to purchase his stock birds must make absolutely certain as far as possible that he is buying sound and healthy fowls. And in this matter he can scarcely do better than get into touch with those who specialize in the work and have a reputation to uphold. Great care must be observed to avoid all specimens of light weight, while those which show any suspicion of disease must not be mated. The slightest unsoundness in the parent often weakly chickens. More attention is now being paid to breed type among utility poultry; but, desirable though it may be in certain circumstances to adhere to it, stamina is, in my opinion, a much more important point to consider.

It may be thought that present-day investigators have shown us what points to look for as being essential in our breeding stocks; but by focusing attention on them they have merely emphasized what has been known to and practised by breeders for generations, and long before the breeding of fowls for egg production was considered of any importance. One thing, however, they have discovered is that the

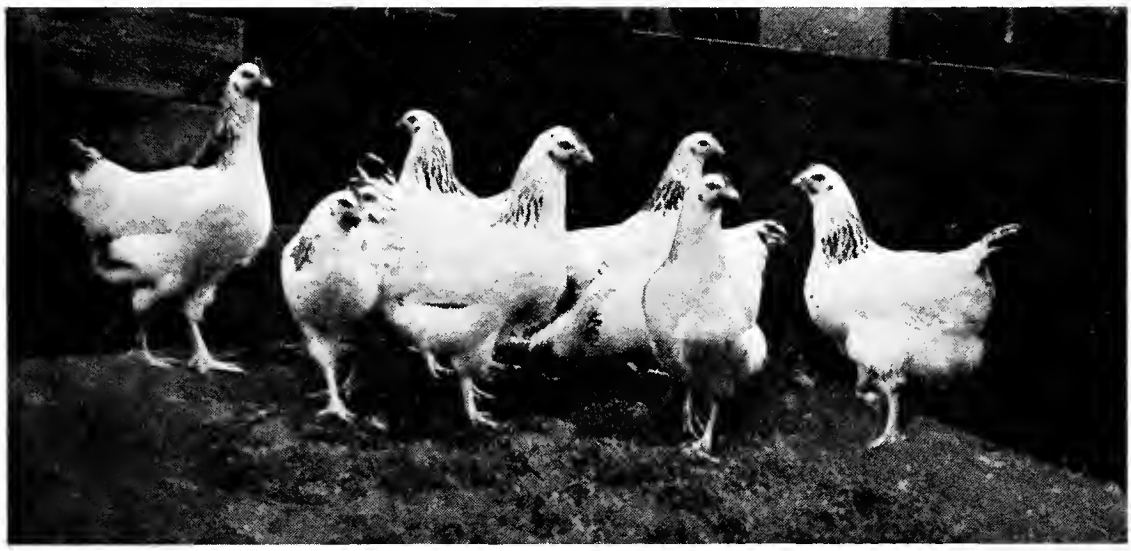


FIG. 68. LIGHT SUSSEX PULLETS

These birds, bred chiefly for laying, lack the depth and width of front desirable in stock for the production of prime market chickens. The pullet on the extreme right is an ideal general-purpose Sussex and shows good depth and development at the stern for egg production

develops under breeding conditions and is transmitted in the progeny before it is detected; and, in consequence, the prospect of a whole season may be lost.

For this reason it is imperative to obtain from the specialist breeder a guarantee that the birds to be purchased for the breeding pens have never at any period of their lives come into contact with any disease, and that they are the progeny of blood-tested stock. And to make assurance doubly sure I strongly advise that each bird be subjected to such a test ere it is mated. I have seen so much trouble caused by neglecting this simple precaution that I certainly observe it in my own fowls, and advise everyone else to do so. The cost is a mere trifle, while the benefits accruing therefrom are many. In addition to avoiding birds of a light weight when selecting the breeding stock, it is also important to guard against superfluous fat. This is an evil too frequently overlooked but one which is the direct cause of infertile eggs as well as handling of layers can be of assistance to those poultry-keepers who do not subject their producers to trap-nests; but more of this anon. Let us at present consider the male bird. It is an axiom that "the stud male is half the flock"—meaning, of course, that his characteristics will be transmitted to the offspring in equal proportion to the hens', even though the latter may outnumber the male twenty to one. Hence the necessity for very careful selection. It is generally recognized that the influence of the parents on the progeny differs; but whereas it was said to be the rule that the sire sways the shape and the outward appearance while the dam controls the temper, habits, size, and constitution, it is not so in practice.

Choosing the Male Birds

No matter for what purpose the breeding stock be purchased, the male bird must be active; and if he is not actually pugnacious, keen to resent interference

with his hens or averse to being handled, then, at any rate, he must be a bird with plenty of vitality and self-assurance—not in the least jumpy or nervous—and a lusty crower. In poultry parlance, such a male bird "fills his eggs," which means that the percentage of fertile eggs from the mating is very high indeed, while the chickens so sired give no trouble, granted, of course, that they are reared on common-sense lines. I have had in my breeding pens young cocks which could not be safely approached by a stranger, while

FIG. 69. A STOCK MALE

This young Rhode Island Red cock is not only a fine specimen of his breed, but possesses all the characteristics of a vigorous stock bird. His carriage is graceful and upright, and his balance true, while his head is alert, his eye bold, his feathering close, and his legs are well set

they were inclined to be aggressive with me, long accustomed as I have been to the handling of fowls of all sorts; but those male birds were truly great "stock-getters." One thing I insist upon when picking out a cockerel for a future breeding pen is that he shall display movement in the hand; that is, when holding the bird between my hands at arms' length, breast downwards and head inwards, I like him to be muscular and energetic, anxious to get on the ground again to face me rather than to turn tail and scuttle away.

Whether the male is required for heading the laying or the table chicken pen, he must have a bold and masculine appearance, a fine intelligent head with a well-developed but not coarse comb which is firm to the touch. There must be nothing mean or narrow about his skull, while his comb should not be so loosely carried that it falls to one side or other of his head. His eyes must be well open, prominent and bright, not placid, and free of any overhanging eyebrow. It is advisable, also, to see that their colour is correct. By this I mean that, for instance, in red-eyed breeds it must be bright red and not light pearl, grey, or green, because all of these off colours, in my experience, are signs of some flaw in a bird's constitution. The upper mandible of his beak must be curved at the point over the lower jaw, somewhat similar to the beak of an eagle, but not so pronounced; the jaws must be short and powerful, broad and deep at the setting on, not long and straight out from a narrow base like a wedge. His face must be full, but not coarse and puffy; there must not be any hollowness of his cheeks, while its appearance and that of his lobes and wattles must be bright, the skin being of fine texture, smooth and without wrinkles. His head should be held well up, denoting a strong neck.

The Body Structure

The cock's body should be broad at the shoulders, full in front (to allow plenty of chest room), and slightly narrowing towards the tail, but not finishing in a fine point; that is, the part of the back known as the saddle should be about two-thirds as wide as at his shoulders. In some breeds it does have the appearance of being as wide at the back as at the front, but this is generally accounted for by the profuseness of his saddle feathering. His back should be broad and straight; there must be no hollowness between the shoulders, no sharp lump across the middle when passing a hand over it or a decided drop towards the tail. Any irregularity or narrowness or deformity of the back indicates weakness of structure. His tail must be well furnished and carried upright at an angle of about 45 degrees to the back; and, when viewed from the front, it must be in a straight line with his comb, neither so upright as almost to touch his head nor deflected to one side, and certainly not drooping. There must be width across the hips and some depth there also.

His abdomen is naturally not so well developed as the female's, and has no particular significance as long as it does not suggest deformity; but it must not be baggy or unduly full, which generally denotes an over-fat condition, detrimental to fertility. From a front view his sides should present a convex rather than a flat appearance; and his wings should be carried closely, and not drooping at their extreme ends. His legs should be straight down, not inclined inwards at the hocks; and there should be about a hand's width between them from his body to his feet. Moreover, he should be springy on his feet, his toes

being well spread out, with the nail points on the ground, and the hind toe not inclined down and inwards. His plumage must be closely fitting, tight, clean and smooth—not fluffed out and loose—more like silk than parchment to the touch, and with very little fluff at the stern.

Handling the Live Bird

Every poultry-keeper who breeds fowls should know how to handle a live bird, and know what kind of bird it is when handled. It will reveal many things which are not visible to the eye, particularly structural defects such as crooked breastbone, round back, wry tail, and faulty toes. These should not be tolerated by the novice, and birds possessing any one of them should be rejected. It is an easy matter to pass a hand along the breastbone, the bone which resembles the keel of a boat. If it is at all twisted or dented, much better discard the bird, no matter what its pedigree, because it is not a minor fault, and will be transmitted to a large percentage of the progeny. Some poultry-keepers are apt to imagine that faulty bone formation, as far as it refers to the keel, is due solely to allowing chickens to perch at a very early age; but this can scarcely be so when it has been observed in fowls which have never perched in their chicken stage but have slept on the ground, while it has been developed in pullets after they have commenced to lay. In my opinion it is due entirely to constitutional weakness, that is, lack of stamina, although it can be aggravated by an unsuitable diet.

However, I strongly advise the beginner not to breed from a fowl, male or female, with a crooked breast, even though one authority declared at a recent conference that it is "decidedly wiser to use a large well-built male with all desirable qualities except the conformation of his breastbone in preference to a poorer one but with a straight breast." The novice, though, will find it wisest to reject such a specimen as the former. While handling the bird for breastbone formation see that the bone is well filled on each side, that is, almost covered with firm flesh, and that it does not stand out like a knife blade. This latter condition, however, is generally only one of other faults, such as lack of weight, narrow body, tough skin, and loose feathering, and these are not the points desirable in a stock cock.

It is advisable not only to handle the chosen male but to see him in his run; he must have a strong and vigorous carriage, move easily and balance properly on his feet. His shank bones should be strong and not too fine; and he should be up to standard weight for his breed. He must be sound in wind and limb. It may appear crude, but the best way to test him for these essentials is to chase him around the run two or three times. Provided he moves easily, breathes freely, and is merely slightly flushed by such exercise, he can be depended on for stock. If he exhibits undue exhaustion, breathes heavily, and turns blue about the comb and face he should be rejected as unsuitable for breeding purposes.

Selecting the Laying Pen Cockerel

When selecting a male bird for the laying pen, the mating from which one anticipates breeding a good

FIG. 70. A WHITE LEGHORN COCKEREL
A good crower is almost invariably a vigorous breeder. This cockerel is fully furnished for the stock pen and possesses all the desirable points of a utility Leghorn

percentage of prolific pullets, it is most desirable that he shall be bred from generations of persistent layers on the dam's side, pedigree bred, and be the son of a hen which has a good record, not only for quantity of eggs, but for size of egg and reasonable winter production. A male bird with known ancestry is much more valuable as a breeder than one of unknown breeding. At one time this was not considered to be of any importance, because it was thought that the sire's influence on the progeny began and ended with the shape (or stamp) of the body and its outward appearance. Specialist breeders of laying strains, however, have found that the male bird's "line" for egg production is quite as important as, if not more

important than, the records of the females with whom he is mated. Hence, while studying health and handling points with which I have just dealt, it is certainly advisable to get, whenever possible, a line-bred male bird, one which comes from a strain which has been carefully bred and recorded for laying

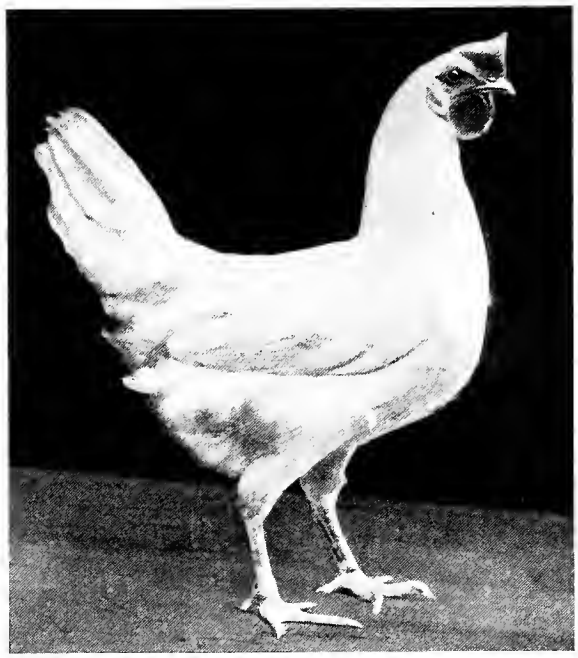


FIG. 71. A WHITE LEGHORN PULLET—UTILITY TYPE
The bird depicted above is an excellent example of what is required in light-breed fowls for prolific egg production

properties. Practical breeders know that moderate laying hens mated with a cockerel from a heavy laying mother will produce better layers than a non-pedigree cockerel with first-class hens.

Let me just caution the beginner on one point, however; that is, although the stock cock he obtains is fully guaranteed as, for instance, the son of a 250-egg hen, it does not follow that the whole of his daughters will likewise be great layers. By using such a male bird, though, in his mating, the novice is likely to get very much better results than by heading his breeding pen with one of no pedigree. Another point of importance is to see that the stock cockerel for the laying pen is of a representative size for his special breed. Some breeders of laying stock place size before health, but while reversing that order, I must admit that it is of importance, especially in view of the fact that, during recent years, there has been a tendency in some quarters to favour under-sized specimens. This may possibly have been due, in no small measure, to breeding from male birds which have been selected solely for the high records of their dams. But while it often happens that a large hen will produce large chickens when she is mated with a good medium-sized cock, I have yet to find it possible to get such progeny when an under-sized male bird is used, even though he may be from standard-sized stock.

The Handling of Hens for Egg Qualities

The best kind of female to mate with such a male as I have just described is one which matches him in practically every point mentioned. It is most advisable to take special notice of her head, since a good layer has a prominent occiput (the back part of the head or skull), a thin and lean face, keen and alert eyes, a large, full and "live" comb with a soft and waxy touch, and full earlobes. A hen with a coarse and puffy face, dull eyes, a small and scurfy comb, and thin shrunken earlobes is not a good producer.

Some authorities have attempted to standardize a laying type of hen; but when one considers the numerous breeds of poultry which exist to-day, it is not surprising that the attempt has been abortive. There is no laying type for all the breeds; as a matter of fact there is not one for each breed. Some years ago one of the best-known poultrymen in America, a veteran of many years' experience, was a visitor at one of the experimental stations. In going over the pens one bird caught his eye as of outstanding merit as a layer. In his words she represented the ideal, the highest expression of the "egg type." He demonstrated to an attending group of students the general points of body conformation, which proved that this bird was one of the world's great layers. Sad it was, but true, that at the end of her first season this paragon of producers, though having always enjoyed the best of health and vigour, was found by examination of her trap-nest record to have produced the magnificent total of—28 eggs in a year!

So far as is now known there is no one external character, or any group of such characters, which will enable us to say with any certainty beforehand that one bird will make a high producer and another a low producer. One can tell that a bird is going to lay, that she is laying, and that she has ceased to lay, but beyond this it is impossible to go, as far as external signs are concerned. There is no real, definite, critical evidence of the existence of such a thing as an "egg type." All that can be done is to select the female for the breeding pen on the same lines as those I suggest for the male; but with this difference—the stern of the former should be large, and this can be ascertained by handling the bird.

The handling system of selecting layers, it may be as well to explain, was invented by the late Mr. Walter Hogan, with the idea of applying it solely to

pullets, and only those which were practically on the point of laying. He claimed that he could tell about how many eggs each pullet he handled by his method would lay in her first season, before an egg had been produced by the bird. The chief points in his system were condition, type, and capacity, the bird's pelvic bones probably being the determining factor. According to Hogan, therefore, the finer those bones were the more eggs the pullet would lay—if they were $\frac{1}{16}$ in. thick, about 220 eggs, if $\frac{1}{8}$ in. thick about 115 eggs, and if 1 in. thick no eggs at all. Another discovery claimed by Hogan was capacity, the space between the pullet's pelvic bones and the end of her keel-bone —the greater the distance the greater the capacity of the bird for producing eggs, and a 3-in. capacity pullet with $\frac{1}{4}$ in. pelvic bones, according to this system, would produce 175 eggs a year.

However, it is a great mistake to imagine that it is possible to state by these or any other measurements that a pullet will lay a specified number of eggs. All that handling can do, and admittedly it is much, is to enable the poultry-keeper to select the good from the bad layers; but the only certain method of ascertaining the exact laying ability of individual birds is to subject them to trap-nesting. Unfortunately, though, the attention necessary under this system entails so much labour that some breeders select their hens for the stock pens on the flock average combined with appearance and handling on a modified scale.

FIG. 72. A WHITE WYANDOTTE PULLET—LAYING TYPE
This pullet, which was awarded first prize in keen competition at a Crystal Palace Show, was selected by one of our foremost commercial breeders (who judged the class in which she was exhibited) as an ideal specimen of the laying type of Wyandotte. She shows, in a marked degree, the stamp of general-purpose fowl to choose for the breeding of layers

There are outward signs which assist us in choosing laying fowls; but it does not answer to rely entirely on one's eye. A good producer is always active and alert; her comb, face, and wattles are flushed, and her eyes are bold and bright. Her body is compact; and at the beginning of her laying period her plumage is bright. She is a hearty eater at the set mealtimes, but she takes time over her food. She is rather on the fleshy side, although not flabby and laden with fat. Slow movers and birds with thick heads are almost invariably poor producers; and so are light-weight fowls, even though they may have ravenous appetites. The old-fashioned idea of a great layer was a hen which bolted her grain and mash and was ever searching for more; but the "bolter" utilizes food in the wrong direction—it is expended on energy, not eggs. These, one might say, are the outward signs, discernible to the trained eye; but they are not sufficiently reliable, hence the necessity for handling to determine the matter.

FIG. 73. HANDLING A PULLET
Most pullets are nervous when being handled for the first time. Holding the bird firmly in one's left hand, stroking it gently down the front, and massaging its wattles between finger and thumb, does much to quieten such a pullet

Hand-grading the Layer

Hand-grading the layer is much more difficult than it appears in print; and it is the work of the specialist rather than the beginner. However, a description of

the process will give the latter some idea of how it is done, and he may be able to apply it with success after some practice. It is chiefly a matter of touch.

The hen to be examined must be held in such a way that she will remain quiet; and this much must be mastered before any attempt is made to proceed with

FIG. 74. HANDLING THE LAYER FOR ABDOMINAL CAPACITY (1)
The bird being handled, a Rhode Island Red, shows good abdominal capacity, that is, the width between her pelvic bones (top) and the end of her keel-bone (bottom) is four fingers

the examination. When undertaking it I hold the hen in my left hand with her head towards my elbow, allowing her keel to rest on my palm and wrist. I firmly but gently grasp her right leg between my thumb and forefinger and her left leg between my middle fingers. This brings her legs slightly inwards; but provided the grip is gentle it will not injure her. If she is at all nervous, I gently massage her wattles, which generally has a most soothing effect. Some birds, admittedly, are so agitated when being handled that an assistant may have to be called in to hold them; but I have never found this necessary, probably because I was almost brought up with hens and am so frequently judging poultry. At any rate, the beginner will be wise to take things easily and to keep his temper, for, after all, some fowls are foolish creatures who want humouring.

When a hen is in full lay her abdomen is large, soft, and dilated; her gizzard and other organs can be easily moved about. Her sphincter (the circular muscle of the vent) is large, moist and pliable, not small, dry, tight, and puckered. Her pelvic bones (the two points of which are almost on a level with the sphincter, one on each side) are widespread, about 1½ in. to 2 in. apart, or, as some say, the width of two to three fingers. The pelvic bones must be carefully felt to ascertain that they are straight and fine, because one may be crooked and the other straight, or one thick and the other thin. The posterior end of her keel or breastbone is well down below her pelvis, 3 in. or more, or the width of four fingers—the hand being placed in a downward direction rather than flat—because the breastbone must not be short. There is a large abdominal cavity, and the quality of its flesh is pliable and of fine texture, elastic one may term it. The keel is covered with pliable flesh, not buried in fat, but by no means sharp and "bladey." There is a space of about 1 in., almost two fingers, between the top of her sphincter and her tail bone. The whole of her skin is of a velvet-like texture, loose and pliable, sliding easily over the muscles when handled. There is no great quantity of fat around her stern, but there must be sufficient of it to protect her organs from abdominal chill.

It may here be remarked that if the hen's abdomen

FIG. 75. HANDLING THE LAYER FOR ABDOMINAL CAPACITY (2)
Demonstrating the width between the pelvic bones; in this case one's two fingers

is hard, full, and firm, somewhat similar to the old-fashioned bladder of lard to the touch—it is then generally also inflamed and almost denuded of feather or fluff—the pelvic bones will perhaps be turned inwards with their points almost touching each other. Such a hen, being in a very fat condition, will be useless for stock purposes, because, while she may lay, she cannot take service; and the retention of

birds of this kind in the breeding pen leads to infertile eggs. To return to the prolific layer, however, the width across her shoulders may be anything from 5 in. to 7 in. and across her hip bones 4 in. to 6 in., while the depth from her back to her keel, which includes her abdominal cavity (referred to by some people as her "egg-bag") may be 5 in. to 7 in. But definite measurements of these parts are best left out of one's calculations, because, naturally, they vary according to breeds. Nevertheless, while the body of a good layer is long rather than dumpy, and somewhat deep, it is never narrow when viewed from the front or the top.

She has a wide full front to allow of good crop capacity, as a prolific layer is a full feeder; and there is always plenty of space between her legs, not only where they are visible on her trunk but at her feet, because narrowness there would indicate a poor producer. The scales on the bird's shanks should be bright and smooth, the bones fairly slender and the toes supple, and each part full and round. There is a spring about her plumage, even when the fluffy parts of her stern and upper legs are handled. Pigmentation, too, plays an important part throughout the whole body in breeds which have yellow skin. The colour is sound just before the bird comes into lay, provided she has been given an egg-producing diet. As the laying period advances the yellow pigment becomes pale and eventually bleaches out, first from the sphincter, then from the ring around her eyes, next from her beak, and finally from her leg shanks. When she has been laying for five to six months this bleaching is perceptible in all the parts mentioned; but the pigment gradually returns when laying has ceased.

Note the Weight of the Egg

Such, then, combined with the particulars mentioned in connexion with the male bird, are the signs of good stock which are bred for egg production. The beginner who can master them and apply them to his fowls will have an excellent idea of their laying qualities. It must not be expected that each bird which is purchased for the breeding pens shall answer to this description in every point, unless the hens intended for stock are obtained while they are in full lay in summer. Few novices, however, would do this and subsequently moult the fowls through on their premises. Hence the best advice I can offer in this direction is to secure the females from good average laying stock, and to mate them with a male bird which is fully guaranteed as being bred from a hen with a reasonably high record. Personally, when selecting females for the breeding pens for the production of layers, I do not place number of eggs before everything else. As a matter of fact, I consider it is a great mistake to choose any hen which has produced an abnormally large number of eggs.

Abnormal layers seldom pass on stamina to their progeny. Hence the best birds to select are those which have laid not more than 220 eggs—but not

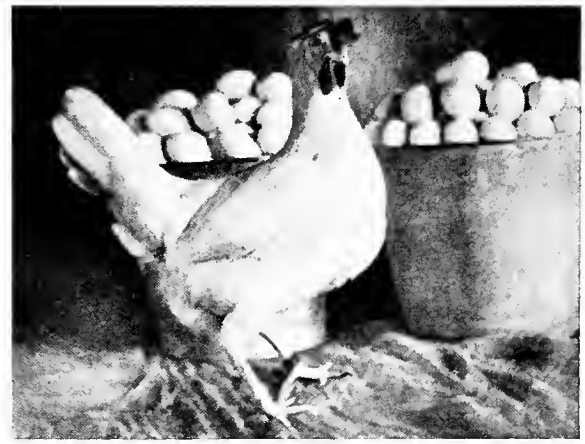


FIG. 76. A GREAT LAYER

A Government-registered White Leghorn hen which laid 282 eggs in one year at a Toronto, Canada, poultry farm. The eggs in the buckets are those collected from this strain of Leghorn and, being white-shelled, they are in great demand in Canada. The White Leghorn is probably the most prolific laying breed of to-day

less than 180—in their pullet year. Weight and size of egg should always take precedence over mere numbers. The beginner should endeavour to secure sound vigorous hens which, as pullets, have laid a reasonable number of good shaped eggs scaling 24 oz. to 27 oz. to the dozen, rather than birds running over the 220 mark but producing a large percentage of eggs which weigh only $1\frac{1}{4}$ oz. to $1\frac{1}{2}$ oz. each. I generally find that utility breeders favour small birds as layers, but in my experience it is a mistake. It is possible to breed layers too small; and this I proved quite recently when, as an experiment, I mated some prolific Black Leghorn hens with a Welsummer cock; the progeny developed the undesirable habit of producing small eggs. There can be no doubt that, without encouraging the flesh-forming character, it is best to raise stock of good medium size. Hence, for the breeding pen, select hens with well-developed and shapely bodies, and those which have already proved their character as free producers of marketable eggs.

One important point I should like to mention in connexion with the breeding stock is that the birds should be treated independently from the laying stock. It is a subject frequently overlooked by poultry-keepers. A pullet which has put up a heavy record during her winter season rarely makes a sound breeder the following spring, while a very prolific laying pullet should not be bred from until her second season; and

even then not until she has gone steadily through her moult and been allowed to recuperate. If there is a brisk demand for autumn and winter eggs by all means cater for it; but the pullets which have brought this return should not be expected to add to it by producing fertile eggs. It is unfortunately too much the custom nowadays, after pullets have gone through heavy winter laying, to run them on for spring breeding. It is folly to imagine that birds can do all this

FIG. 77. THE IDEAL TABLE TYPE

The Sussex is an ideal fowl for table purposes; and this pullet, a Speckled, shows to perfection the stamp of bird which should be selected for the breeding pen. She is deep through the body, full fronted, close feathered, and has width between her legs, while the latter are of the correct length

in a satisfactory manner; and the sooner it is understood the better it will be for the industry generally.

Another point I have noticed with reference to very prolific laying is that, as a general rule, the record pullets produce the largest proportion of infertile eggs, simply because their rations have been given with the aim of getting from them the maximum of eggs.

Selecting Stock for the Production of Table Fowls

There appears to be an impression among poultry-keepers that the only table fowls which return a price that enables the producer to make a fair margin of profit are those which are marketed from Surrey, Sussex, and Kent, in which counties the systematic fattening of poultry has for years been adopted with the greatest success. It has been put to me that, as this is the work of experts, it is useless for the ordinary breeder to attempt table poultry production. It is, however, a great mistake to imagine that such prime market fowls as those fatteners do produce are the beginning and end of table birds. On the other hand, it is also a mistake to think that, for instance, surplus male chickens from laying strains or those from general-purpose breeds, as long as they are young and healthy, will answer for market. And it is this latter, undoubtedly, which has led some people to assert that the production of table birds, no matter how remunerative it may be to the professional fattener, is not a commercial proposition for the poultry-farmer.

I have never agreed with that assertion, because it is not difficult to dispose of the right class of fowl at a figure which makes the business worth while. Cockerels which are bred and fed solely with a view to killing them for table and sold while they are young and soft, should always be profitable to the producer, granted that they are marketed at the proper season. It is a question of catering for special demands. Hence it is most essential for those who intend to make the production of table chickens a paying side-line, or to specialize in it, to inquire fully of salesmen ere commencing. It must be remembered that such poultry as are sent from the fattening centres of the south-eastern counties of England are in demand for the very pick of the London markets and to meet what in some quarters is looked upon nowadays as a "luxury" trade. But, even so, it is by no means the only trade which is done in table fowls, because the range is from $3\frac{1}{2}$ lb. birds upwards.

For many years it was thought that only white-skinned and white-legged poultry were marketable; but, while some salesmen still suggest that the birds be "preferably white-fleshed," it does not mean that other kinds are not demanded by the public. Nor is it a fact that only fattened (crammed) fowls can be disposed of at a profit to the producer, because there is an increasing demand for unfattened birds. To be successful at the business he who produces must study the markets and cater for what is required, either by private consumers when direct sales are made, or by the middleman. I have been told that what the salesmen want to-day is a regular supply of well-bred and well-fed chickens "plump breasted and soft; of small size, and preferably white-fleshed." Breast meat is certainly an important point, because large and coarse fowls with an undue proportion of bone and frame to flesh are difficult to dispose of and decidedly unremunerative to produce.

However, these small-sized birds are for one section of the trade only. A breeder of my acquaintance, who has had a vast experience in catering for

the hotel trade, was emphatic in his assertion that so many poultry-farmers fail with table fowls because they do not know what constitutes a first-class market chicken. In his view the ideal is a rather small but plump bird, broad and deep breasted, with the minimum of offal, and almost resembling a partridge; and on no account, he said, should it be fattened by cramming. On the other hand, another breeder, equally experienced at rearing fowls for the markets, insists that the most important points to be considered in the production of such birds are delicacy of flesh, whiteness of skin, and great size without coarseness. In his opinion it is folly to imagine that a table fowl must be fine-boned and with little offal; and he assured me that it is quite possible to get a fine-grained bird with large bone. What the fattener requires, he stated, is a large frame for the cramming work, because if the frame is there the flesh can be put on and a heavy bird is the result.

Here, then, are the views of two practical men, and each a specialist in his own line, which proves that the market is not confined to one class of bird. There is, undoubtedly, an increasing demand for the medium-sized but plump chicken, practically devoid of fat and offal, just as there is a good market for the big bird which has been fattened and finished by the professional crammer, because, despite what has been said about there being no trade these days for "large joints," there are still householders who have sufficient oven space to take Surrey fowls.

Study the Markets

In my experience it simply amounts to catering for individual tastes; I find that some people prefer dry meat and others "wet," that is, soft. The flesh of the small fowl is generally short and dry to the palate, somewhat similar to game but not as highly flavoured, while that of the crammed bird is soft and mild, and, as one might almost say, it melts in the mouth. The medium-sized and plump chicken appears admirably to suit those who dine out, where a wing portion or a leg is merely one item of the many on the menu, whereas the other is preferred by the family man. I must say, though, that artificial fattening by the cramming process, as practised in the south-eastern counties of England for generations, does render the flesh of the roast fowl exceedingly tender, savoury, and easy to digest, as well as adding very considerably to the weight of a suitable bird.

However, to consider the selection of the stock birds for the production of table fowls. It is an important matter, because the breeder should aim at producing the best, whether it be for the large, the medium, or the small bird trade. When the object is to cater for the class known in the London markets as the "Surrey," it is advisable to choose a male bird which

FIG. 78. READY FOR STOCK

These Buff Orpington cockerels have been selected for the breeding pens. They show the depth of body required in this excellent general-purpose breed, but only one of them—the bird on the extreme left—has a really good standard comb. This cockerel, undoubtedly, is the best of them all for breed characteristics

is deep-breasted, heavy-bodied, wide from front to stern, on fairly short legs, and stout boned without being coarse. Although of such a stamp he must be active on his feet and handle well; and by the latter I mean that when lifted from the ground he should be firm and fleshy, not merely big boned, lumpy and feathery. The females to mate with him should also be big, long-backed and stout boned, but, above all, of a tame and quiet disposition, because the progeny of such birds fatten more readily than do chickens of lightly-built and nervous fowls. They should, nevertheless, be fairly active, energetic enough to seek for their corn and not so idle as to spend most of their time on the perch.

For the other class the male bird should be plump-breasted but not as long-bodied or as full at the stern; he should stand erect and balance himself on his legs, which means that he must have good muscular development attaching his thighs to his stern. For such as him the best mates are females of medium size, but stocky bodied, broad across the cushion, fairly short-legged, and having light rather than heavy bone but not spindle-shanks. On no account should hens of laying strains be chosen, not even when the object is to cross the breeds for the production of small table fowls because, while the layer should have width and fullness of front to allow of crop capacity, she has practically no breast meat.

Whatever class of table chicken is to be bred, it is imperative that the male bird in the breeding pen has a meaty breast, meat and muscle in this case being the same. Those who make a feature of producing market fowls are aware that the maximum amount of breast meat is all-important for the best prices. It has always been a great feature in the prime poultry sent from the fattening centres; but salesmen are making a special appeal for it nowadays in unfattened birds, because all too frequently in the general run of cockerels they are asked to handle there is a serious lack of breast development. To develop muscle on his breast, the stock male bird must have large and powerful wings (for his size) and he must be allowed to exercise them to promote the growth of muscle. It can be imagined, therefore, that vigour is important in the highest degree when selecting stock for the breeding of table poultry, because it ensures hardiness and quick growth in the chickens, both of which are necessary, and particularly for the early markets. Let me emphasize one point: in no case is it advisable to choose birds of laying strains, whether on the male or the female side. Keep the layers and the table poultry as distinct stock, and thus will the best results be achieved.

When Fresh Stock Arrive

One little matter in connexion with the breeding stock which I had almost overlooked is that, if the birds arrive from a distance, isolate them immediately; that is, keep them where there is no possibility of their coming into contact with other poultry which may be on the place. This applies to all fowls, young and old, which have travelled. It is not enough to give them just one inspection as they are taken out of the basket, no matter how thorough that inspection may be, and then to turn them down to mix with the fowls already running about. This frequently happens when a cockerel is brought in to mate with one's own hens. Nevertheless, even though he may appear to be in sound health, I find it advisable to put him into strict quarantine for perhaps as long as a fortnight.

This isolation of fresh stock gives one the opportunity of ascertaining whether or not the birds have developed trouble on the journey. This does not mean that I suspect the carriers of being careless in the handling of live-stock, although one of the biggest breeders in this country from whom I once purchased some day-old chicks, which developed pullorum disease, tried to convince me that the birds had caught it en route—which was an insult to my intelligence.

However, stock birds, and others, have been known to catch cold on a journey, particularly if they have had to wait about at junctions or have reached their destination after hours. A cold may not be noticeable when the fowls arrive, but, by isolation it can be detected in its early stages and treated before it has had a chance to spread. Moreover, while the stock are in quarantine they are much easier to catch up and handle for blood-testing; and, despite what may be said to the contrary, this test is necessary. I am a firm believer in it, because I have had ample proof of its efficacy and seen the splendid results achieved by its application to stock birds from whom had previously been obtained most appalling losses among the chickens. The idea of making a blood-test is to ascertain if the particular bird is free or otherwise of certain germs; to see, in fact, if it is or is not what is termed a "carrier." It is technically known as the blood agglutination test, because if the fowl is a carrier, and a culture containing the microbes of the disease is introduced into the samples of blood, they unite or come together, i.e. agglutinate.

Blood-testing

It is, of course, necessary to test every male and female from which one intends to breed, that is, to submit to a research laboratory a separate sample of each bird's blood properly labelled. The result enables the poultry breeder to exclude from his pens every carrier fowl. The samples have to be very carefully taken; but the operation is as simple as extracting blood from one's own finger.

In the case of the fowl the sample is taken from a large artery under its wing, across the knuckle where the wing joins the body. An assistant is handy to hold the fowl and prevent it struggling. Remove some of the fluff and wipe the skin with cotton wool soaked in methylated spirit, but be very careful to let the skin dry before piercing it. See, also, that the needle is clean before inserting it into the artery; pierce gently, catch the blood carefully in a capillary tube and blow it into the test tube, which immediately close and number according to the leg band of the bird from which the sample is taken. Dab the wound with the cotton wool if the blood continues to flow after the operation. However, full instructions are always sent with the tubes, etc., by the authority who undertakes the test; and one can obtain from the Poultry Pathological Research Laboratory, Goring, Reading, Berks, all the necessary paraphernalia.

To get one's stock birds blood-tested, and to breed only from those which are free of it, is the very best way of stamping out pullorum disease. It is better to have the fowls tested when in a somewhat low condition, viz. at moulting time, than when they are vigorous—in the case of pullets and hens when coming into lay or while in full lay.

The Best Age for Breeders

The age at which stock fowls should be put together for breeding purposes is a subject on which there is some difference of opinion among poultrymen; and especially is this so as regards the females. It is generally agreed that cockerels of the light breeds should not be bred from until they are at least eight months of age and others not before they are ten months old. That younger male birds can be successfully used for stock there is no doubt; in this direction I recall experiments I once undertook with a six-month-old Welsummer and an eight-month-old Indian Game, both of which sired some satisfactory chickens. However, for all practical utility purposes, and particularly for the production of layers, it is seldom found necessary to put a male into the breeding pen until he is almost a year old, and at any rate well-furnished. One thing is essential, nevertheless, and that is, the young male bird must be sure of himself, because it is useless to attempt breeding from one, no matter how good his pedigree may be, who is not absolutely "cock of the walk." On very rare occasions I have known of some which failed to master their hens, and, obviously, they were discarded.

It must not be thought that cockerels only should head the breeding pens, because old males can be and

FIG. 79. WHITE WYANDOTTES

A fine breeding pen of utility White Wyandottes, although the hen on the extreme right is much nearer the exhibition than the laying type

are used with success. Cocks can live to eight or nine years, while some have reached a riper age; and more than one "old stager" has been successfully exhibited. But as stock birds it is seldom advisable to breed from them after their fourth year, since when beyond that age most male fowls are failures for reproduction ends. Many pedigree breeders do not retain their stock cocks longer than the second season because, they argue, there is always a sufficient supply of young cocks to replace the old ones. By so doing, notwithstanding, they are wrong. I must admit that in too many cases the second-year male bird which is intended for the following season's breeding pen is not properly attended to in his off-duty months; that is, when the breeding stock has been disbanded and the moulting season is in sight, he is neglected. Hence the reason for some poultrymen imagining that only cockerels are suitable for the purpose.

Male birds are considered to be mature when they are ready for the breeding pen; but a fowl is not mature until it has grown to its full size. As I have said, cockerels are ready for breeding at eight to ten months old, according to whether they are of the light or heavy breed. They reach puberty—the age at

which the reproductive organs begin to be functionally active—long before they are fully grown. Left to himself, unmated, a male fowl would not be fully grown until he had re-furnished after his first adult moult, which is his second full moult. Generally, therefore, he may be said to be fully grown when between two and three years old. The cock is, consequently, best for breeding when about such an age. Of course, there are, and sometimes must be, exceptions to this rule, because for instance, Dorking fowls are among the slowest to reach full growth, Bresse among the quickest, and Wyandottes probably about half-way between them. Still, I feel sure that if pedigree breeders of laying stock were to breed only from matured cocks instead of cockerels they would get much better stamina in their pullets for egg production.

Stock cockerels should be bought in the autumn if they are required for the breeding pen during winter or spring. Most young male birds which are sold then have been spring-hatched, whereas if they are purchased in the spring, this is not ensured, because they may have been hatched during the summer and are not likely to be sufficiently developed when they are required for early breeding. I am fully convinced, not only from actual results carefully noted but from what is revealed under post-mortem examination, that the best stock male birds are not to be found among the very early winter hatches. Hence it is most desirable that cockerels which are required for breeding purposes should be hatched from January to March, those of the general-purpose breeds in the former months and other kinds in March. I am well aware that for commercial egg-farming it is becoming the custom to hatch pullets for laying as early as November, while some even advocate hatching them before that month. But although this is probably necessary to ensure a plentiful supply of new-laid eggs at all seasons of the year, and, moreover, beneficial for the production of first-grade marketable eggs in autumn, it is most unwise to retain for stock any cockerels from those very early hatches. These young males should be marketed as soon as they are of a suitable size for the table.

Breeding from Pullets

It is in connexion with the age of the females for the breeding pen that so much difference of opinion exists. For very many years now I have insisted that it is most injudicious to breed from pullets for the production of stock birds; and I have every reason to know that what I repeatedly warned poultry-keepers would be the inevitable result if they persisted in disregarding such advice has happened. It is seen to-day in the lack of stamina in some strains of layers, in the smallness of the birds and the small size of their eggs. I was among the very first to stress the importance of treating the breeding stock as apart altogether from the actual layers. It is most inadvisable to breed from pullets, unless such birds are mated solely for the production of chickens for market, in which case the whole of the progeny should be killed long before it is fully furnished. In this instance, for table chicken production, it is generally the plan to breed from January-hatched pullets and March-hatched cockerels, mating the birds in autumn or early in winter. By that time the females have

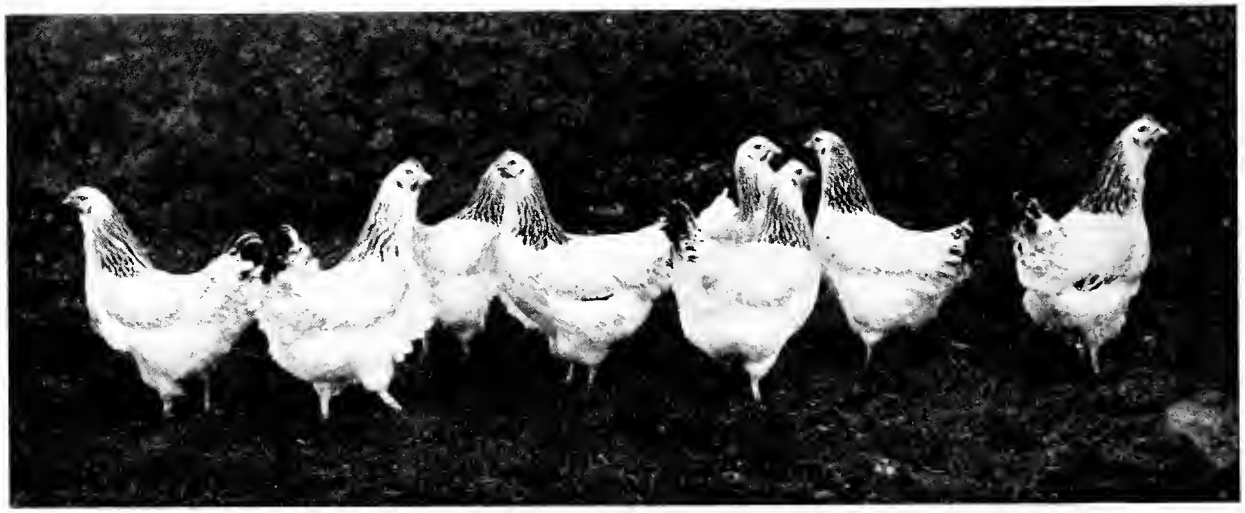
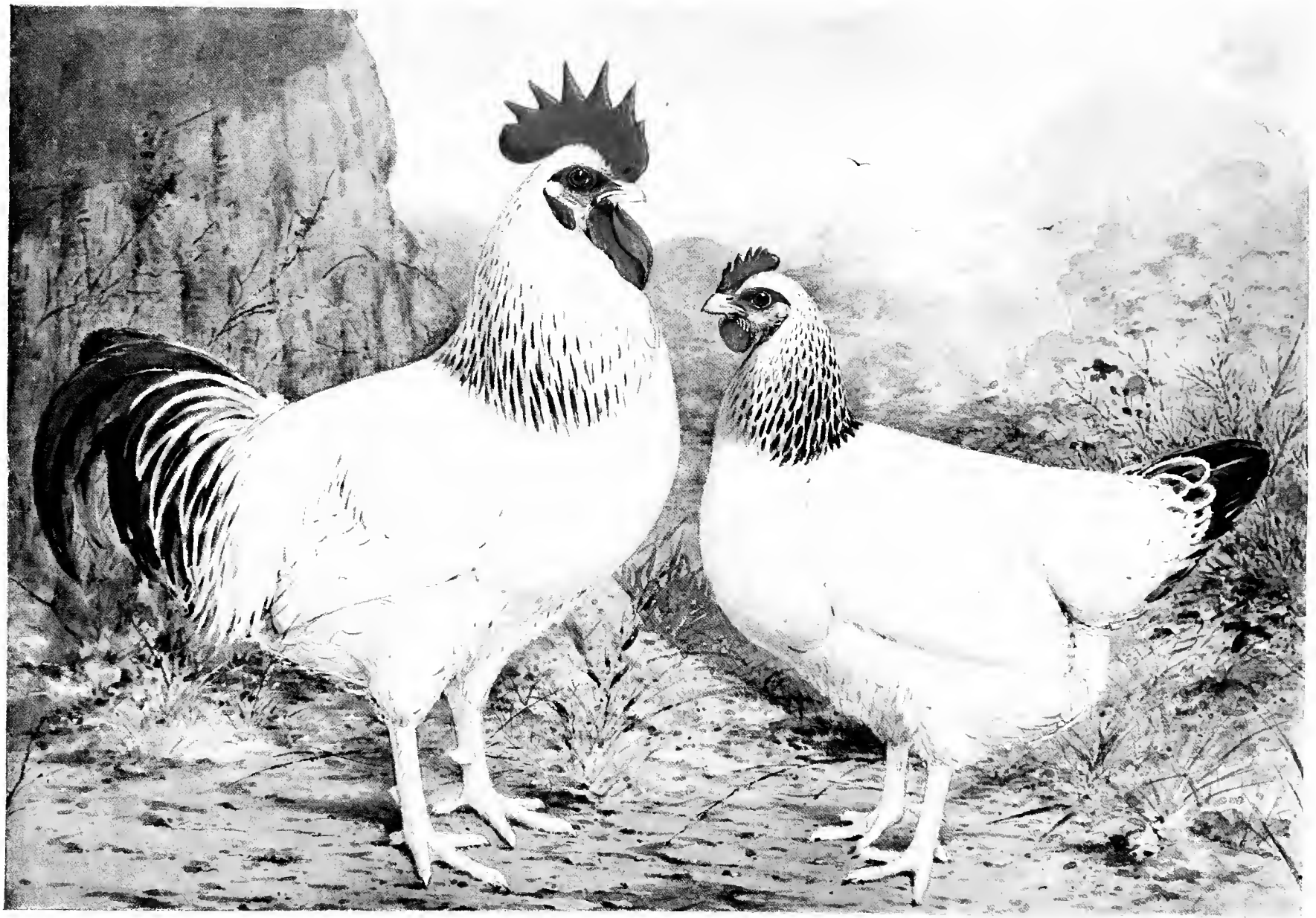


FIG. 80. LIGHT SUSSEX PULLETS

A fine sample of exhibition-bred Light Sussex, showing very promising hackle-striping and correct wing and tail markings. The bird fourth from the left is well posed for outline

PLATE I



LIGHT SUSSEX

probably laid their first batches of eggs and gone through their moult, because there would be no object in the table poultry breeder keeping his pullets in lay throughout summer. But, as I say, the whole of the chickens are marketed and not reared for stock.

Some commercial poultry-farmers also breed from January pullets, big and fairly well-furnished birds, and mated with March cockerels. Nevertheless, the resulting pullets should be kept for no other purpose than egg production, and scrapped at the end of their first or second laying season; that is, they should on no account be used as stock birds. I know well enough that there are breeders who do not agree with me in this matter; but many who were opposed to it are changing their views, and the remainder will follow when they thoroughly understand the breeding of fowls. It must be admitted that when one has scored for the first time at a laying test, the demand for hatching eggs may be so great that, human nature being what it is, there is a temptation to breed from every available bird, no matter how young, to cope with the orders received. But it is a mistake, and a policy which often leads to that particular strain of fowls getting a bad name. There are, of course, people who argue that a pullet in her prime makes one of the best breeders. Nevertheless, while a pullet is considered by such advocates to have reached maturity when she commences her laying career she, like the cockerel, is not mature until she has grown to her full size.

A pullet may start to lay at five months; but her ovary is functionally active long before she is fully grown. A spring-hatched pullet always develops more rapidly than does her sister hatched in summer or winter; but it is not correct to say that she is mature when she first starts to lay. Indeed, such a bird is rarely fully developed when production commences, and she is not fully grown until she has completed her first laying year and recovered from the moult which follows. A hen is best for breeding when in her second laying year, although no hen in the stock pen should exceed four years, unless she has very special merits. Let me repeat that a pullet which is coming into production for the first time is physically fit for service, but the bird is not then fully developed. Hence for the production of laying stock, birds which will eventually be bred from, it is most essential to choose hens, and those with at least one year's trap-nest record behind them. Such birds are decidedly preferable to untried pullets, even though these latter be the daughters of record dams.

The Mating of Fowls

One or two minor points bearing on the breeding and mating of the fowls may be of service to the novice. The first concerns the breeding season. In my early years it was considered correct to put the birds together for stock purposes in November or December and to disband them during the following April. But since, nowadays, there is practically no set hatching season there is no set breeding period. It is so, at any rate, where poultry-farming is being undertaken; because, while the beginner will probably find it answers his purpose to hatch chickens in March and April, on many farms the period for hatching extends from September to June, and occasionally even into July. In fact, the chicken season seldom comes to an end, broods being brought off all through the year.

However, for the general poultry-keeper, it depends upon the purpose for which the birds are to be reared. Presuming the object to be the production of pullets to commence laying in late autumn or early winter, a start should be made in January with general-purpose breeds, while February will be soon enough to hatch out other kinds. On the other hand, if the aim be summer laying—in some parts of the country pullets which give of their best then prove more profitable than others—the chickens must be out in autumn, because they do not develop at the same rate as spring-hatched pullets. Thus, then, for the production of layers there are two mating periods, viz. October to January, and February to May.

To produce table fowls for the spring trade the stock must be mated long before Christmas, if big and plump chickens are required for the first markets —"spring" in this case referring to the time of killing and not that of hatching. On the other hand, I have reared February chickens to a suitable weight for Epsom week, and they have well repaid me for my trouble. Then, too, table fowls include *petits poussins* marketed at a month or so old, asparagus chickens of ten to twelve weeks of age, milk chickens, roasters, summer poults, and capons, any or all of which may be worth consideration. For market birds, therefore, the breeding season opens in September and closes about April. Then for the show pen—and many a novice is keen on exhibiting his fowls—early hatching is essential if the birds are to be fairly well-furnished for the early summer events, although no "chicken," or bird for a chicken class, at a poultry show may be hatched before 1st November. For the production of breeding stock January to March are the best months, as I have already mentioned, but for autumn sales there is much in getting the chickens hatched in early winter. The breeding season, therefore, varies according to the object in view.

For the duration of strong and healthy fertility the fowls should be mated for not longer than six months. Some poultry-keepers imagine that the male birds

should be run with the females all the year round; but it is best to keep the cocks and cockerels, hens and pullets separated until they are required, and to breed from them only at certain seasons. As an old authority on poultry once remarked to me, "If you wish to breed healthy and strong birds of any particular strain, never let the young cocks which you intend breeding from run with any hens or pullets until the time that you match up in November or December, according to the breed." That is sound advice, as sound now as when it was first given, many years ago. I have heard that at least one of our present-day authorities advocates allowing cockerels and pullets to mix from the shell, or at any rate long before the former have found their voice or the pullets have started to lay, and to keep the selected birds together all through their days. It is a fact, and has been known among breeders of exhibition stock for generations, that a cockerel grows better, that is, furnishes quicker for show purposes, if he is allowed to run with pullets than if reared alone. But I have yet to learn that he makes as reliable a stock bird by being reared all along with pullets, or that cocks are better sires if they are kept with hens year in and year out.

It is a common belief that very early mating produces more cockerels than pullets, which means that in all hatches brought off during the winter months the percentage of cockerels is high. It is also stated by some authorities that if a vigorous yearling cock be mated with not more than three second-season or older hens, males will largely predominate in at least the early broods, and that pullets are generally in excess when a two-year-old cock is run with six or more vigorous matured pullets or young hens. I cannot recall any official tests conducted for the purpose of determining whether or not early mating does produce more males than females in comparison with breeding late in the year. So far my experience is that a preponderance of one sex or the other cannot be guaranteed under the foregoing conditions. However, I have an idea that feeding and environment have much more to do with breeding and sex control than most poultry specialists appear to imagine, although so far I have not had the opportunity of putting my theory to the test for as long a period as I should like. Still, I do not find that early mating produces more cockerels than pullets.

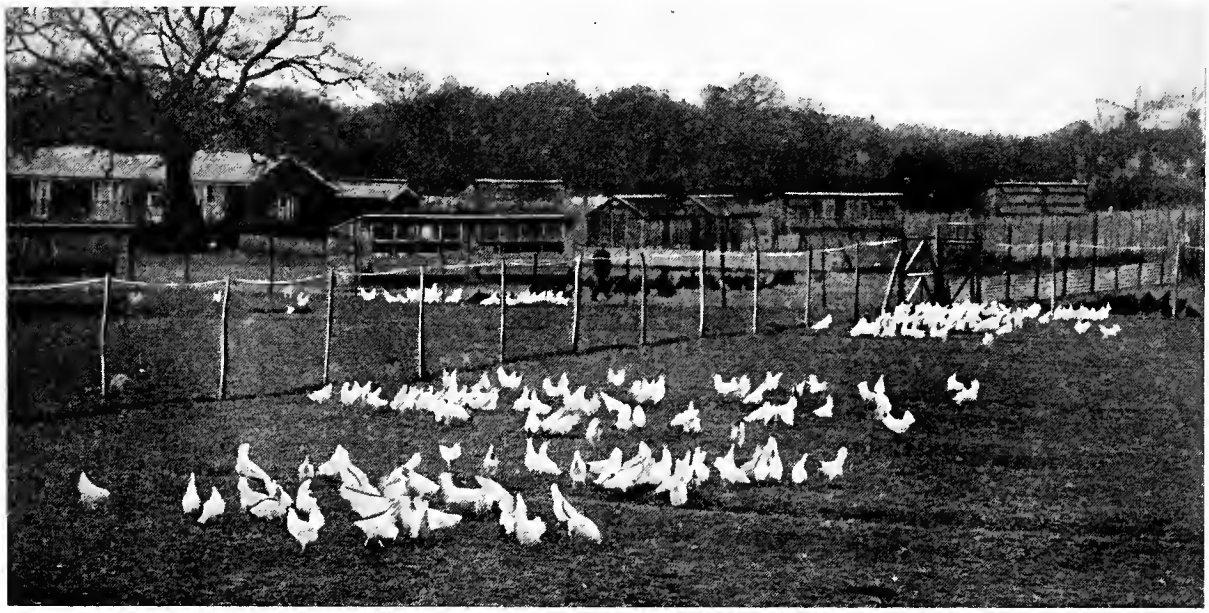


FIG. 81. WHITE LEGHORNS
A section of a poultry farm in Hampshire, owned by a well-known pedigree-breeder of Laying Test winners. A fine flock of White Leghorns, with Rhode Island Reds in the distance

For Early Production

It was a popular idea at one time—and it may account for one breeder advocating the mixing of the sexes from the shell—that pullets could not come into production unless a male bird was with them. However, this is not so, because pullets—and hens—thrive as well without a male bird as with one; indeed, at some periods of the year the females keep in much better condition when they are by themselves, while there can be no doubt, also, that they lay quite as well. When fowls are kept in enclosed runs and their

eggs are not required for hatching purposes, there is certainly no need to have a male bird with them; but when they are allowed free range and may then be liable to mix with other birds, a cock in the flock generally has the effect of preventing their straying. Some years ago a series of experiments was undertaken to determine the value of a male bird in a pen of layers; and they proved conclusively that when hens were kept without males the eggs were produced at about 30 per cent less cost than in exactly similar flocks which were mated with cocks and cockerels.

Moreover, in some instances the production of eggs was almost one-third more from the pens without male birds than in others of precisely the same kind and managed on similar lines, except that the presence of the male was permitted. Keeping cocks or cockerels with laying fowls, therefore, except when fertile eggs are wanted, is a mistake in many ways—the eggs are produced less economically and they are liable to be not so numerous, while, beyond this, if they have to be preserved or "pickled," the fertile eggs do not remain in sound condition for any length of time. The presence or absence of the male bird does not in any way affect the quality of the egg itself; and it is foolish to imagine that a fertile egg is more nutritious than an infertile one. It must be admitted, however, that second-season and older hens which are kept with a vigorous young male bird when they have furnished up after their moult do sometimes come into lay again—and when of the sitting class become broody—at an earlier period than unmated hens, although, candidly, this is more a question of strain (family) than mere mating.

I have never yet found it necessary to mate a cockerel with pullets in their first laying season to bring them into lay and keep them at production, or to ensure the females being good breeders in subsequent years. I have frequently bred from third-season hens which have previously never been mated, while I almost invariably keep those pullets which I select for stock solely for testing during their laying season, and without a male bird. In each case, excellent results have been obtained. It has been said that unless the birds are mated in their first egg year a large percentage of them will become sterile when arriving at their second year and, therefore, they will not be fit to use for stock purposes during that year or, presumably, at any time. That is certainly not my experience; and I cannot find any practical breeder who agrees with it.

Number of Hens to form a Pen

As regards the breeding pen, it is generally difficult for the beginner to decide just how many hens he should allow to run with a male bird to ensure a high percentage of fertile eggs, because it is fairly obvious that there must be a limit even for the most vigorous cockerel. As it is, though, no hard-and-fast rule can be made in this matter, since it depends on many things, not the least of which are the age of the male, the class of fowl being dealt with, the conditions under which the birds are kept, and the season of the year. It is very seldom necessary when breeding utility stock to go in for single mating, that is, to breed from a pair only; and the occasions on which this might be found advisable are when one is breeding to pedigree and endeavouring to fix a certain character in the strain or to test the value of a bird for stock. On the other hand, some commercial egg-farmers who breed their own pullets for laying go in for flock mating; and in this case they run several male birds with a large flock of hens, practically at free range.

Personally, however, I much prefer to have each breeding pen by itself, that is, one male with a specified number of females, since it enables me to keep a check on the performance of the stock. It is an easy matter, in such circumstances, to trace any slight defect that may arise and to remedy it at the earliest possible moment. No matter how sound the breeding birds may be it may happen that one of the females is not taking service; and this cannot always be detected until her eggs have been incubated. I find that I can keep an eye on a score of such pens much better than a similar number of fowls running at large and flock-mated. Moreover, my experience is that the average of fertility is much higher in the former case than in the latter, probably because when several male birds are running together with hens, some of them are apt to be cowed by their more vigorous associates. I have frequently observed it on farms, and where the male birds have every opportunity of getting out of each other's way. But a cowed cockerel is practically useless as a breeder.

Now with regard to these single male-bird matings, when a vigorous yearling cock is used I generally limit the number of his females to a dozen second-year hens during the early part of the breeding season, but turn in as many as a score of mates for spring hatches. This, I may say, refers to the light and non-sitting breeds for the production of layers. With general-purpose kinds a dozen hens is the maximum at any time, while six is the number for late autumn or early winter mating. These latter numbers also apply to the breeding pens put together for the production of market chickens. When a second-year cock is mated he is limited to about half a dozen young hens, these generally being very early hatched pullets which have moulted through in the autumn. However, as a rule

I prefer that the males shall be younger than the females, whether they be yearlings or adults.

Close Observation Necessary

Such matings as those mentioned above may well act as a basis; but it is essential that the stock be kept under close observation, because an extra vigorous cockerel may require a larger number of hens, otherwise those with him may be injured, and there will be a failure of chickens. Springtime is, of course, the natural mating season; but comparatively few poultry-breeders nowadays delay mating operations until then. As I have said elsewhere, nevertheless, cockerels which are hatched then are almost invariably the best to select for future stock pens, a fact which is known to those who have had much experience at breeding poultry. Winter cockerels never appear to furnish up and come to maturity at the same rate as birds which are hatched early in spring; and the same may be said of males from the late hatches, chickens which do not make their appearance until midsummer. This, however, does not apply to the pullets, at least to the very early hatched ones, unless they are of the heavy breeds.

It is advisable, when using hens in the breeding pens, to let them be well-furnished again after their moult before mating them. The same, of course, applies to second-year and older male birds. I do not like to mix the sexes during the moulting season, and especially when the birds are required for show purposes. Still, even with utility stock, it is much preferable to let hens go through their change of feather apart from the males. The experienced breeder who has to get fresh stock generally does so well ahead of the time he requires to mate the birds; and more often than not he likes to moult them on his own premises. This method may not appeal to beginners, because it means that the birds have to be boarded for some weeks before there is any hope of getting a return from them. Nevertheless, it is an excellent plan to adopt, as it ensures their being properly managed and settling down to their new quarters. Admittedly, moulting is quite a natural process, although among fowls under domestication it differs considerably from birds in a wild state. They certainly require a little extra attention at such times; hence my suggestion that the breeder has the stock under his own care during their moult.

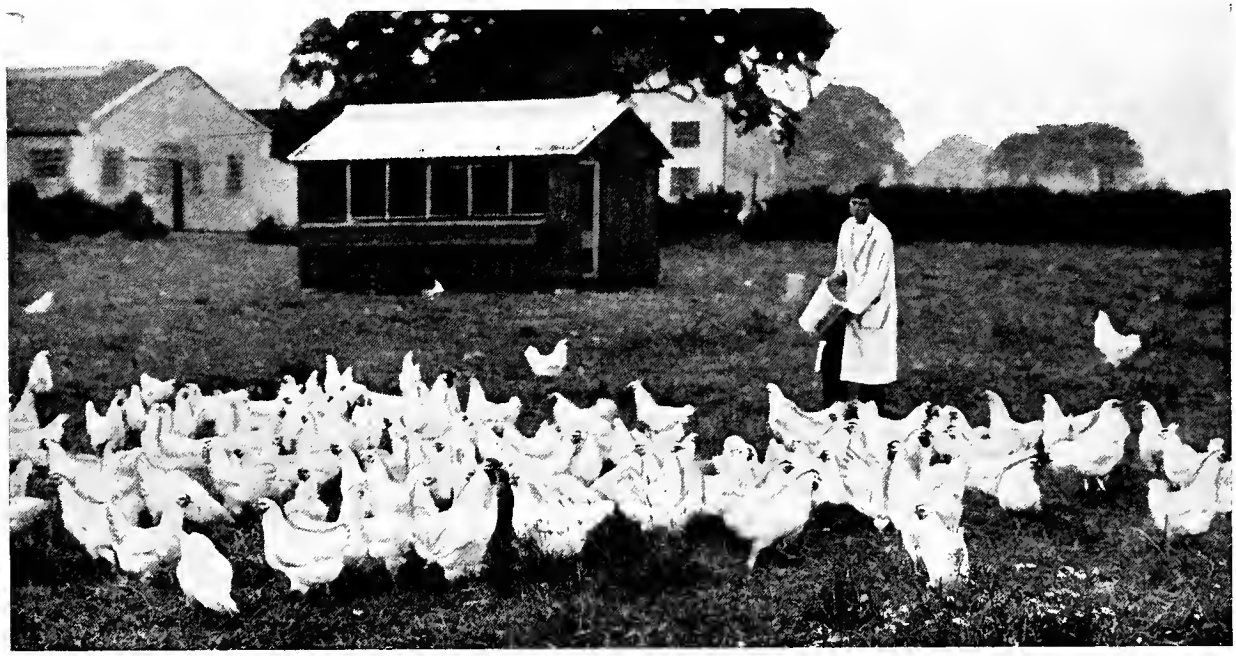


FIG. 82. UTILITY WHITE WYANDOTTES
A flock of White Wyandottes mated specially for egg production, the females showing good egg capacity

One other item may be mentioned here before passing on to consider the general management of the fowls in the stock pens. Such terms as "cockerel-breeding" and "pullet-breeding" pens are used in connexion with the mating of poultry. This has led many novices to imagine that the expert breeder has some means of ensuring that certain unions of fowls will produce nothing but cockerels and others all

pullets. It is not so, however, although if it were possible it would probably be a great boon to the commercial egg-farmer. As it is, the terms refer solely to the breeding of stock for exhibition, and for such characteristics as colour, markings, and head points. Thus, for instance, if a pen be mated for "pullet-breeding" the cockerel progeny will be useless for the show bench, because in certain characteristics they will not conform to the standard for the male bird of that particular breed. Of course, this does not apply to every variety of poultry which is exhibited, since for some of them the standard of excellence is so formed that it is possible to breed representative specimens of both sexes from a single pen. It is practically impossible even to guarantee a preponderance of pullets or cockerels in any hatch.

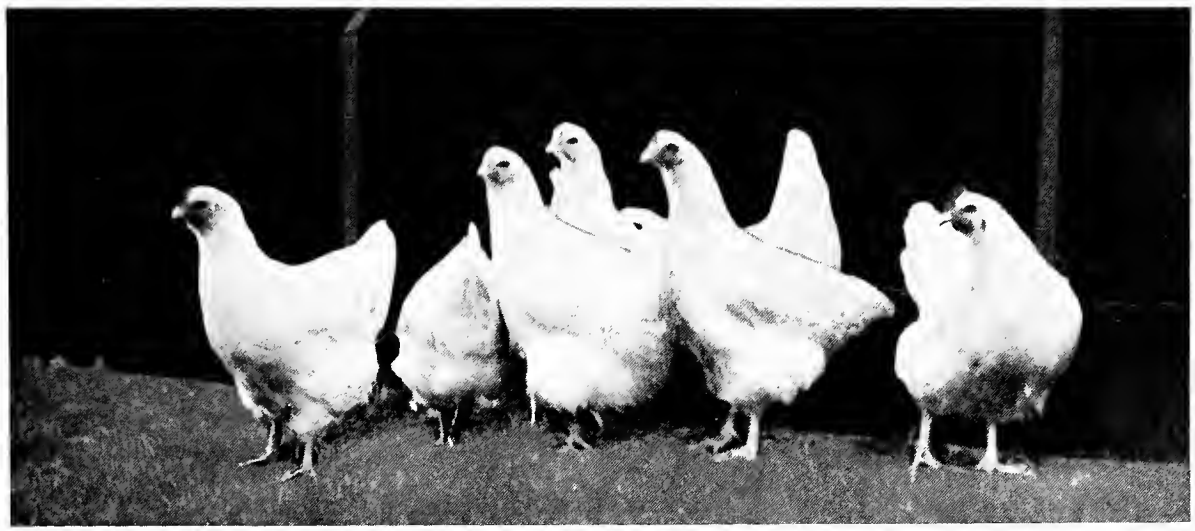


FIG. 83. WHITE ORPINGTON PULLETS

The White Orpington is a good general-purpose breed and has some satisfactory egg records to its credit. The bird on the left gives the reader an excellent idea of the Old Type Orpington, and shows fine stern development for egg production

The General Management of Stock Birds

Perhaps the most important part in the management of the breeding stock is to ensure that neither the males nor the females shall get too fat to be of service. It is essential that they be kept in hard condition; and for this reason the first consideration is to provide them with a wide range. I am not denying that fowls cannot be bred from when they are kept in a small run in the garden. I have had breeding stock in such quarters and, moreover, have succeeded with birds housed strictly on the intensive system, without any outside run. Nevertheless, I feel sure there would be no reason to complain of lack of stamina among laying strains if the whole of the breeding stock were allowed to enjoy practically free range. It would ensure strongly fertilized eggs and sturdy chickens.

In any case, though, it does not answer to breed continually from fowls which are kept in small quarters. This was made very evident to me in my experiments with the breeding pens I was keeping on the intensive system; in the third generation there was too high a percentage of weak germs, which resulted in some eggs failing to hatch and others producing chickens which grew slowly and feathered badly. If the stock must be confined to grass runs it is advisable to allow the birds at least twice the amount of space that is mentioned as the minimum for layers.

The feeding of the fowls requires careful supervision; and it is generally expedient to exclude from their rations any food of an overheating and fattening nature, such as maize and maize meal. An entire grain diet is sometimes advocated; but excessive grain-feeding is apt to fatten the hens. Hence, when feeding my stock birds I see that they get one meal *per diem* of soft food, and this is in the form of wet mash. On no account should they be as heavily fed as pullets which are producing eggs in winter. I do not, therefore, allow them to have dry mash which, when supplied to layers, is left before them all day; and I consider it a mistake, also, to let them have layers' mash or anything in the way of a forcing diet. In the early part of the season my stock birds get grain for their breakfast and wet mash in the afternoon, just two meals *per diem*; and they do not have access to dry mash. Their grain mixture consists of

wheat and barley, as three measures to one, while if French buckwheat is available half a measure of it is added to the mixture. The allowance of corn averages, roughly, 2 oz. a head, on hard days rather more than less; and unless the weather is fine they get their meal under cover.

A Good Mash

I make their soft food of one measure each of barley meal and home-milled bran and two measures of best weatings—the last being the name now given to English middlings, sharps, and similar wheat offals of a fine texture. Since there is little chance of the birds finding natural animal food in their range during winter I include in their mash meat meal, or white fish meal, or crushed raw bones, at the rate of about ¼ oz. a head. The raw bone is mixed in at the last moment, but I always soak meat and fish meals by themselves in boiling water for ten minutes or longer, as they can then be more easily distributed through the mash. As a change of diet, twice or thrice a month, biscuit meal with bean meal or pea meal may take the place of the barley meal; but on such days it is expedient to withhold fish, meat, or crushed bone from the diet.

My birds are allowed to fill their crops with soft food in winter, and the quantity works out at about 4 oz. for each fowl. This may appear to be more than is good for them; it would be if it were dry meal only, but since it includes practically little solid meal and about an equal quantity of water, possibly more water than meal, it will do them no harm and will certainly not result in their being overfed, which, of course, must be avoided. On the other hand, it is detrimental to underfeed breeding birds. It is a great mistake to feed the breeding hens heavily for egg production; in fact, when the object is stamina—and that, surely, is essential in breeding stock—pullets should not be forced for laying during their first season, that is, before they are put into the stock pens. Breeders and layers must be treated as distinct stock.

When the stock are kept where they cannot get grass and the oddments of vegetation they pick up while on free range, they will appreciate some cabbage leaves or other fresh green food daily. Failing such a supply, utilize whatever is handy in the form of potato peelings and similar discards from vegetables prepared for table; but see that they are gently boiled and well chopped, so that they can be mixed through the soft food. And to prepare the meal use the water in which they are cooked, as it contains many valuable properties. Do not omit a supply of clean drinking water; and on very cold mornings see that it is slightly warm, that is, give it to the birds "with the chill off," but not hot. This will be greatly appreciated, because fowls require water as much as do other creatures; and they will not drink freely if it is icy cold. Grit and shell-forming material are as essential for breeders as for layers; hence if the birds are unable to get what they require during their wanderings keep some crushed flint and oyster shell or limestone grit within their reach, or, better still, throw a handful of it down with their grain once a week.

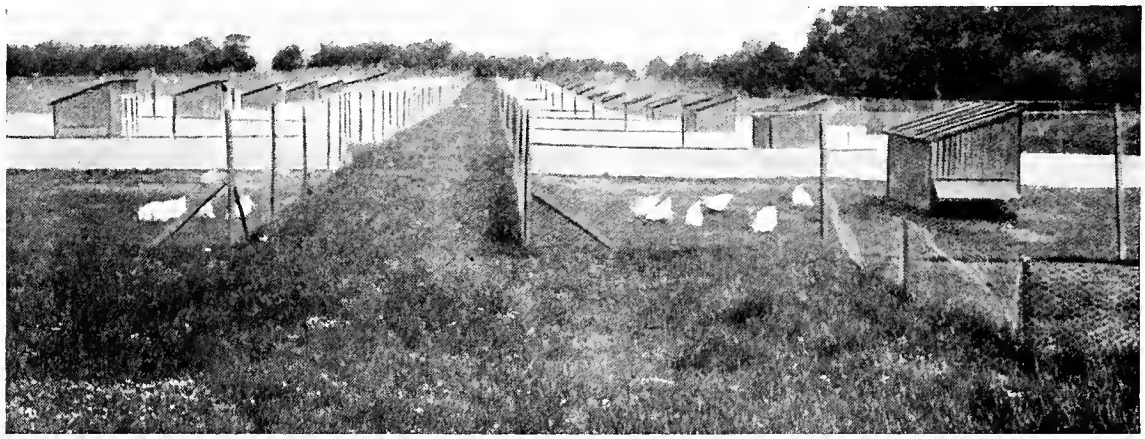


FIG. 84. BREEDING PENS

The excellently arranged breeding-pen section of a Devonshire poultry farm. The runs are for single pens, i.e. each contains one male bird with a small number of hens

Watch the Birds Feeding

I have mentioned over-feeding. It is generally the hens which are the culprits, perhaps because they require so much extra food to enable them to lay. Rarely does the male bird get too fat to be of service;

indeed, unless some care is exercised he may not take sufficient food to keep him in breeding condition. This is a point which must be watched. No doubt some readers have heard of the "gallant gentleman" fowl who stands aside until the hens have had their meal. There is nothing gallant about such an action; it is just utter foolishness, if it does not indicate that the bird is out of condition. I never like to be in a hurry when feeding my stock, possibly because I object to rushing through my own meals. However, whether giving the birds corn or mash I always find time to stand by for a few minutes to see that all of them take their food. If they do not, if one hangs back, then a note is made and the case is inquired into, because no fowl should refuse sound food when only two meals *per diem* are provided. If the male bird should stand aside he must be taken out of the house at night and not returned to the hens until he has had breakfast.

Of course, this adds to one's labour; but a little extra attention in this way for three or four days generally has the desired effect. Shy feeders never make satisfactory breeders. I would much rather the stock male were inclined to be selfish when the meals are put down than that he should deny himself food, although one who appears to want the trough to himself and drives the hens away is intolerant—and probably requires a liver tonic. It is fowl nature for the cock to call his hens to their food; but he must feed with them. I find it beneficial during the breeding season to handle the birds occasionally after they have gone to roost for the day. I like to assure myself that all is well, that they are feeding properly and that none of the hens is running to fat. Should there be anything wrong it is an easy matter to remove any which requires special treatment. This handling is an excellent way of keeping the birds tame; and such stock, whether for breeding or laying, gives much better results than nervous creatures.

It is perhaps hardly necessary to mention that the fowls must be well housed; but they do not require any coddling in this direction. Let them have dry sleeping quarters and also, for preference, some place in which they can work when rough weather prevails. It will not harm them to be out in the rain, although they have enough sense to take shelter during storms. However, they dislike wind; hence they should have protection from it.

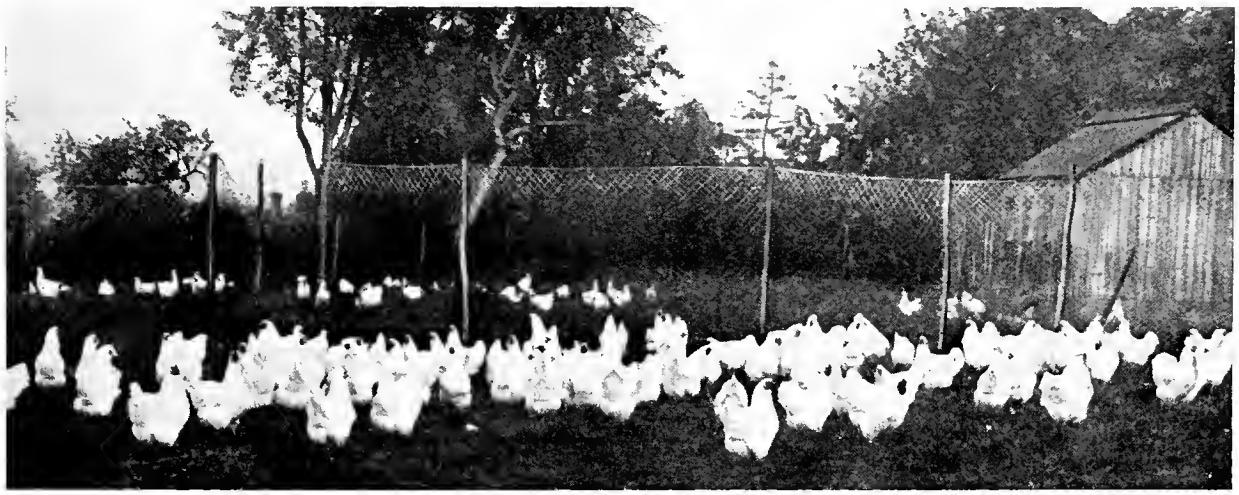


FIG. 85. EXHIBITION WHITE WYANDOTTES
In the foreground, an excellent flock of White Wyandottes, both cocks and hens being of the stamp to produce standard-bred stock

Good housing is particularly essential if the stock birds are purchased in late summer, with the intention of bringing them through their moult on one's own premises. It is always beneficial to give them a little extra care at such a time, because it is when they are changing their plumage that they are liable to catch cold. Moulting is neither an ailment nor a disease, since most fowls pass through it once a year, generally towards the end of summer, or at the beginning of autumn; but a little extra attention is necessary during the process. The birds must be kept dry and reasonably warm. Nevertheless, it is a great mistake to accommodate them in small places with very little room, a plan adopted by some poultry-keepers with the idea of assisting the fowls through their change of plumage. Such confinement may force them the sooner to cast their old plumage, but it has a great tendency unduly to lower their vitality. Exercise and fresh air tend to make muscular fowls and to keep them in fit condition for breeding; and that is the

object for which the stock should be moulted at home.

Disbanding the Pens

It is advisable not to keep the birds mated for too long a spell; and, generally speaking, six months should be the maximum. Breeding pens which are put together early in the season should be broken up and the fowls dispersed by the end of March, leaving any necessary continuity of production to the spring-mated stock. No hard-and-fast rule is possible, however, in such a detail of management, so much depending upon individual circumstances; but, except in the case of very vigorous male birds and very well-conditioned females, those of the earlier matings will probably, before April, be showing some decrease in fertility and a corresponding lack of stamina in the progeny, which should be avoided before it occurs. Even the birds of the spring matings should be subjected to careful examination relative to suitable breeding condition, particularly the male birds. When the disintegration of a breeding pen takes place, the proper disposal of the individual members requires consideration, remembering that the object of the division of the sexes is recuperative—as regards those birds which will be reserved for re-mating.

The separation must not only be thorough, but it must continue until the desired condition is recovered. An out-of-the-way field is the best situation for the cocks, where they will be beyond sight and sound of the hens, and where the surroundings are strange enough to interest them, and the range is suitable to their constant employment at foraging work. Those appliances known as cockerel boxes are well enough where their use is unavoidable, but the free run is altogether preferable; and in any case the hens should be accorded the freedom of a wide grass range. In the disbanding of the pens, when the old hens are set aside for sale, the same treatment should be extended to those roosters whose services will no longer be required—a detail too often unduly delayed. In many instances the male birds intended for next season's breeding pens are put aside in small coops and given scant attention; but it is very unwise to treat them in such a careless manner, for it is impossible to retain good health and condition without due regard to proper accommodation.

Concerning Fertility

There are two or three other matters in connexion with breeding which can well be dealt with here. One concerns the fertilization of the eggs, that is, how soon after the birds have been mated will it be safe to collect the eggs for hatching. Briefly it may be said that, if the hens are laying at the time they are put with the cock bird, the eggs can be relied on as fertile about a week after mating, while if the females are on the verge of laying, then the first eggs will probably be fertilized. It is, however, the custom to test out the earliest eggs —if any trade is done in "sittings"—by having them incubated for a week, at the end of which time it can be seen whether they are fertile or clear. Another problem that is often difficult to solve by the novice is whether eggs are fertilized day by day or a batch at a time. Without going into a mass of detail, however, I may state that since the oviduct of a hen can accommodate six eggs, and of the six one might be equipped with a shell, not more than five eggs are likely to be fertilized at once.

Then, too, there is the matter of mixing the breeds. I am often asked if hens of two distinct breeds are mated at the same time with a male bird of one of those breeds, will there be any pure-bred chickens; if, for example, Minorca and Leghorn hens are run with a Minorca cockerel, will the chickens from the Minorca hens be pure-bred? Now, extremely simple as this subject is to one who understands fowls, it has occasionally given rise to quite heated discussion; and yet it is hardly possible to understand why anyone should question it. Admittedly, with the two breeds mentioned there would be some difficulty in distinguishing the eggs, unless the hens were trap-nested, because both kinds produce white-shelled eggs. Nevertheless, the only cross-bred chickens would be those from the fertilized eggs laid by the Leghorns. It could not possibly be otherwise.

The same doubt arises if the hens are used for crossing in the early part of the season and mated with a male bird of their own breed later on; some people have stated that pure-bred chickens will never be produced from the latter union. It is, nevertheless, as great a mistake as the other. If, for instance, one were to mate an Indian Game cockerel with Light Sussex hens in September, for the production of early market chickens, and in January or later, mate the same hens with a Light Sussex cockerel, allowing at least a fortnight to elapse between the two matings, the progeny of the second union would be as pure-bred as Light Sussex chickens could be, and they would have no trace of Indian Game in them.

Cross-breeding for Utility Purposes

A question which often arises when novices are contemplating the formation of their breeding pens is whether pure-bred or cross-bred chickens are likely to answer their purpose the better. To the fancier, of course, only standard-bred fowls possess any value, while the nearer the birds are to the standard of excellence set up for them by the various specialist clubs the more satisfactory is such stock. Breeders

of the old school are generally strongly opposed to cross-breeding for the sole production of birds known simply as crosses, perhaps because there is a fear that the old varieties may have to give place to others. However, the general poultry-keeper who looks to his fowls for something more than beauty has to choose between pure-bred birds of laying strains and cross-bred fowls.

It must be thoroughly understood that there is a vast difference between cross-bred chickens and mongrels. A mongrel is the result of an indiscriminate mixture of breeds, no special purpose being aimed for in selecting its ancestors; and it has no pedigree. On the other hand, a cross-bred fowl in the ordinary acceptance of this term is the product of two distinct pure breeds, although it is in this instance, strictly speaking, a first-cross. The term "cross-bred" is also applicable to the result of crossing several pure breeds; the bird contains the blood of different varieties, the mixture being intentional, as great care and attention have been bestowed on selecting the parent stock. The breeder has had a fixed object in view, and the pedigree is traceable.

One of the greatest advantages of going in for pure-bred fowls is that one knows more or less exactly what the progeny will be like, the offspring closely resembling the parents. This is a matter particularly affecting the poultry-keeper who sells breeding stock, eggs for hatching, or day-old chicks, as it is necessary for him to be able to guarantee, in a large measure, the stamp and colour of the birds. Pure breeds cost no more than cross-bred fowls to house and feed, and yet the offspring and the eggs therefrom are able to command better prices—the lowest figure for a reliable pure-bred pullet is almost 50 per cent higher than the highest price for a cross-bred one. The difference here is very striking indeed, and if one possesses extra-good parent stock the offspring is worth a great deal more. Moreover, only by depending upon pure-bred fowls is it possible to breed up a good laying strain, for the reason that cross-bred birds vary much in their economic qualities. There are, however, many poultry-keepers to-day who have no wish to specialize in the sale of stock birds, eggs for hatching, or day-old chicks, and, to such, cross-bred fowls make a strong appeal, as for some purposes they are to be recommended.

Old breeders, as I have said, are generally opposed to cross-breeding; but it has been found that many of those breeds which have been kept as pure varieties for a number of years have produced, when mated with birds of other breeds, progeny far more prolific. In some cases old characteristics which had helped to make the breed famous in the past, but which had been lost in the endeavour to get exhibition points, have been revived by the introduction of the blood of another breed. It is possible, by exercising the utmost care in selection and mating of the parents, to continue to a marked degree the good qualities of two distinct varieties; and in this direction it should always be remembered that, as far as possible, breeds should be mated together which possess different characteristics. For instance one would obtain quite a satisfactory result by crossing fowls of a breed with laying qualities with those of a breed noted for the fineness of its flesh. But it is of little use, save to give added strength and vigour to the offspring, to mate together two breeds noted for egg production, because they would be too nearly alike for the chickens to possess any better qualities than the parents.

Mating Light with Heavy Breeds

On the other hand, if a cockerel of a light breed be mated with hens of a general-purpose kind, the offspring will be quite different from either parent; and if the stock has been very carefully selected, the chickens should possess some of the good qualities of both parents. They should be larger than the sire, lay larger eggs than the dams (and probably more of them), and be hardier and more active. When egg production is the leading feature it is all-important that broodiness in the fowls should be avoided as much as possible. Many poultry-keepers seek to produce birds in which this propensity is reduced to a minimum by mating together fowls of two non-sitting breeds. It has been my experience, however, that in many cases of non-sitting crosses, in spite of the non-sitting proclivities of the original birds, 10 per cent at least of the resulting progeny will show signs of broodiness; and this proportion is likely to be increased if the birds are bred from again. It has been said that if a cock of a non-sitting breed is used the second year—i.e. with the first-cross pullets—the percentage of broody birds will be greater than in the first cross, while if this plan be followed a sitting variety will soon be produced. This, I doubt.

Generally speaking, when a male bird of a non-sitting breed is mated with hens of a general-purpose (and sitting) breed, 50 per cent of the pullets resulting from that union are liable to become broody. It is worth noting, nevertheless, that in the vast majority of instances where hens of a sitting class are used, the female progeny will be layers of brown or tinted shelled eggs. Perhaps the strongest point in its favour is that crossing has the effect of increasing hardiness in the offspring, the birds being able to stand conditions which may be quite impossible to some of the pure breeds. Especially is this of importance when one is keeping fowls under conditions which are the

reverse of favourable. It must not be thought that, in suggesting cross-breeding or advocating the keeping of cross-bred birds, I wish to deprecate the value of pure breeds. Crosses cannot possibly be produced without the use of pure breeds even if merely on the male side, because it would be most detrimental to use a cross-bred cockerel in the breeding pen. Quite as much care is required in selecting stock for crossing as when mating up pure breeds.

Prolific cross-bred pullets for egg production cannot be obtained simply by the mating together of two mediocre pure breeds. It is essential that at least the male bird which is used in the stock pen is chosen for his dam's record; and since cockerels of reliable laying strains can frequently be purchased at reasonable prices, many such birds are used for crossing. They are almost invariably of the light and non-sitting breeds, while the hens which are selected to mate with them are of the other class. Considering the large numbers of pedigree layers which now exist in pure breeds, it might strike the novice as being somewhat futile to attempt cross-breeding for egg production. There are, however, poultry-keepers who prefer such birds to pure breeds, while many of them find that cross-bred pullets, not mongrels, meet all their requirements for market eggs; added to which, of course, there is the undoubted hardiness of cross-bred fowls. It is surprising, too, what great improvement can be made in ordinary farmyard stock by mating the pick of the hens each season with pure-bred cockerels of dependable laying strains.

Where cross-breeding, in my experience, is particularly beneficial is in the production of chickens for table. As I have previously remarked, the demand in the markets more than ever is for fowls with wealth and depth of breast meat; and in this direction it is possible to utilize some breeds which are seldom recognized by poultry authorities as being of true utility value. Whatever may be said of Indian Game and Old English Game, for instance, as pure breeds no one would attempt to keep them solely for utility purposes. And yet there are no better male birds for the production of table chickens, the former especially when great size is required, but both of them for deep breast meat. I have experimented with cockerels of both of these breeds, the Indian Game even with light breed hens, in which case the amount of breast meat on the cross-bred cockerels surprised me. However, it may be said that, for the specialist in eggs for hatching, day-old chicks, and the rearing of stock birds for sale, pure breeds will be selected. On the other hand, poultrymen who rear for market will chiefly depend on cross breeds, while the average poultry-keeper will probably try his hand at crossing, although he will, in all likelihood, eventually mate up his stock birds for the production of pure breeds of reliable utility strains.

Study the Buyer

Before leaving this subject I would suggest to the beginner that he studies the buyer. When one is mating up stock birds it will seldom be with the sole intention of keeping the progeny at home, so to speak. That is, the only object will scarcely be to retain all the pullets on the premises as the future layers, and to kill the cockerels simply as they are required for one's own table. However big the demands might be in this direction it would not be worth while, even with a single pen, to trouble about the breeding of fowls, because day-old chicks would do for the purpose and these birds are always available during most months of the year, and certainly in the hatching season. There will be a surplus from the stock pen, and the breeder will have to dispose of those birds. It is a small matter, perhaps; but even in this private trade, for such it will be, it is wise to study the consumer.

In the way of eggs, there may be buyers who are quite satisfied as long as they can be assured of getting new-laids irrespective of size or the colour of the shell. On the other hand, however, specials may be required, eggs weighing about 2½ oz., while there may be a demand for brown-shelled eggs only. Some people are really faddy concerning the colour of the shell; they have an idea that brown-shelled eggs are the richest. This, let me add, is merely a fad; there is not the slightest difference between brown, tinted, and white (shelled) eggs as regards nourishment, because the quality of the contents is not governed by the colour of the shell but by the health of the bird which produces the egg. However, where the fad exists by all means cater for it. Then, as regards table fowls, those which have plenty of meat on them and are not merely skin and bone are likely to meet with a ready sale, while most private customers like to have the birds cleaned and trussed ready for the oven. Many a quite ordinary chicken can be given a tempting appearance when it is properly dressed. These are minor matters, no doubt; but the poultry-keeper who is anxious to dispose of his "wares" to the best advantage will be wise to take note of them.

CHAPTER V

THE INCUBATION OF EGGS

AN authority on the hatching of eggs recently wrote: "Egg-incubation is indeed a subject of very great importance, inasmuch as upon the method employed by the poultry-keeper depends very largely his success or failure." Undoubtedly that is so; and yet one might feel inclined to question it on seeing a clucking hen return to the farmyard after an absence of several weeks with a full brood of sturdy chicks, which she has incubated quite unaided by man.

For some time prior to her sitting on the eggs she must have slipped quietly away from the flock to deposit her produce in a nest she had fashioned for herself in some out-of-the-way place, probably in a hedge bottom and carefully concealed from view. This she visited whenever she laid; and there the eggs remained exposed to the air, perhaps for weeks, and at the mercy of rats and other vermin. But, almost invariably, the stolen nests of eggs, untouched by man, produce excellent results. I have seen the remnants of several such nests, but rarely, if ever, has there been in one of them a sign of poor hatching in the form of a clear or an unhatched egg. I recall once seeing at a farm a hen with a clutch of twenty splendid chicks which she had just brought out in such a manner; but only the empty shells were to be found in the nest, which I inspected.

That is Nature's method, assuredly the ideal one for hatching chickens; but I am afraid that it would not be possible in these days to depend solely on the broods from stolen nests as the means of renewing our stocks. Perhaps we demand too much. Nevertheless, few of us can afford to await Nature's pleasure to that extent, although it does ensure stamina from the start. Even those who hatch and rear game, particularly pheasants, are not satisfied with the results from wild nests only, because thousands of these birds are brought out and up annually by means of ordinary broody hens. And maybe this is as well, since poultry-keepers in such districts who have broody hens for disposal at pheasant-hatching time, or rather when sitters are in request, are generally able to realize a satisfactory price for the birds; and they are not required until about the end of the usual hatching season.

When residing in Buckinghamshire, in pre-war days, it was a very remunerative side-line for some of us who were poultry-farming, to sell cluck hens to the pheasant rearers in late spring, and to buy them in again at less than half price at the end of the season; because they were then well in their moult and could be heavily fed for winter laying, while most of them were finally disposed of as cluckers early the following year for the hatching and rearing of ducklings.

Making Preparations for Hatching

However, to return to the incubation of eggs; whether it be undertaken by hens or by artificial means, it is advisable not to leave anything to chance. Preparations should be made in good time; and it is by no means a bad plan to decide at the beginning how many eggs are to be incubated. Of course, this will depend on the object in view and, if the chickens are to be reared at home, what amount of space can be allotted to them. This latter is a most important point, as it would be disastrous to crowd the rearing ground. With adequate accommodation, therefore, it is better to arrange for fairly large numbers at a time than to bring up single hen hatches. Admittedly, the novice has to get his hand in; and yet he can do so quite as easily with a dozen hens as with one, while he should be able to manage a fairly good-sized incubator. It is particularly advisable when hen-hatching rather than when incubating by artificial means that this method should be adopted. It is seldom, of course, that the breeder will limit his chickens to only one hatch a year, that is, get all those he requires hatched on the same day. Nevertheless, I find it more convenient to arrange for fortnightly or monthly hatches throughout the season than so to set the hens that single broods will be hatching out every few days.

Even granted that the farmyard hen who brings off her full brood of sturdy chicks does so without the slightest attention from her owner, it is not possible, even if desirable, for the ordinary poultry rearer to permit his fowls to follow Nature so closely. Admittedly, it is essential for him to produce strong chickens; but to do so does not mean that he must be haphazard in his methods. On the contrary, the more attention he pays to details the greater likelihood is there of getting satisfactory results.

There are quite a number of factors in incubation which it is necessary to study. In the first place he should set eggs only from carefully selected breeding pens, containing high-vitality hens. And in this direction I would caution the novice not to choose eggs from pullets which have put up abnormally high records. I admit having done so on one or two

occasions, but the subsequent results convinced me that it was most unwise to proceed along those lines. Practical poultrymen are aware that such records are almost invariably due to exceptional precocity of the performers; and these exceptional birds should be excluded from the breeding pen until their third season. They have done their duty in acting as publicity agents for their particular strains; they have demonstrated what can be accomplished in the way of laying. Hence it will pay their owners much better to rest them up for some months than to use them for stock as soon as they have moulted, or at the tail end of their first laying year. Such a rest, allowing them to get back to Nature as it were, will enable them to recuperate and regain the vitality they require to produce thoroughly reliable eggs.

The Best Eggs to Select

Care should be exercised when selecting the eggs which are to be set under the hen or in the incubator. It has been stated that the size of the chicken is in proportion to the egg size; and that is so, up to a point. It must not be forgotten, however, that some of the biggest fowls of to-day, notably Brahmas and Cochins, are hatched from small rather than large eggs. Still, as a general rule I find it advisable to discard those under 2 oz. each, and prefer to select eggs nearer $2\frac{1}{4}$ oz. Abnormalities on either side of the scale should be avoided. A very large egg may produce an outsize chick—one I set did so, from a White Wyandotte, but the brooding hen promptly slew it—and yet they may produce monstrosities. Hence, aim for those of 2 oz. to $2\frac{1}{4}$ oz. They should be of good shape, smooth-shelled, and nest-clean. Those which are long and narrow, or have bulges round the centre, or are misshapen in any way, others with rough, thin, brittle, or lime-spotted shells, and any from dirty nests are better kept for the house than incubated.

On no account should eggs be washed before being set; neither should they be greased in any way. If they are slightly soiled—and eggs which are collected from ranging fowls during wet weather are apt to get dirty in the nests on account of mud being taken in on the birds' feet—it is advisable to scrape the soiled parts very gently with a penknife or to remove the dirt with a moist (not wet) cloth. Do not, however, wash the eggs or polish them if they have to be stored.

Egg Bloom and Hen Oil

No doubt some readers will have heard of the bloom of new-laid eggs; but it must not be imagined that it is similar to the bloom that one sees on growing peaches, plums, apples, and other produce of bush or tree. As it is, that of the newly-laid egg is scarcely perceptible to the eye of the expert, and it can certainly not be distinguished by the novice. It is not such as entails very delicate handling of the produce to ensure its being maintained. As a matter of fact it is so firmly attached to the shell that unless the egg is scrubbed it is not removed to any extent.

Lubricant is required by the layer before the egg can be deposited in the nest—suspension of the albuminous lubricant in the oviduct leads to egg-binding—but it is of such a texture that it certainly does not impart any noticeable bloom to the egg. I have examined eggs directly they were laid, and have even waited patiently for a hen to produce one while I have been judging at a show; but even though eggs may be expelled while the shells are moist they dry almost immediately they reach the outside air. And that drying does not leave what ordinary folk would term a bloom on the shell. It is, therefore, a mistake to think that eggs possess a bloom which can be removed by clean handling, and that such handling deteriorates their value. It is not advisable, though, to wash eggs which have to be held for any length of time, because water is very apt thus to enter the pores of the shell and result in considerable deterioration of the contents.

Mentioning bloom reminds me of hen oil. Many people who are interested in hatching have doubtless heard of it but are sceptical about its existence. Those who know more than the casual observer about poultry are aware that hen oil is deposited on eggs which are being incubated by hens; and it is because of this that month-old eggs can be incubated much more successfully under hens than in an artificial incubator. The shells of eggs upon which a broody hen has been sitting possess a glossy and oily appearance, while those which have been incubated by artificial means are devoid of it. Some of these latter may obtain a certain gloss, but it is of an entirely different nature from the glossiness of hen-hatched eggs. Nevertheless, the fact remains that the protective agency—for such it is—has been deposited on the shell by the fowl.

Careful observation of the hen reveals that by divesting herself of some of the plumage covering her breast—in order naturally to heat the eggs—she covers the shells with the exudate from the quill follicles. And on account of the abnormal temperature during the period of broodiness the exudate is copious, regular, and comparatively long-continued. Thus the quill follicles accommodate themselves to a distinct function while the bird is broody; in short, they are connected with glands of secretion which distribute their contents according to the economy of Nature.

This is a demonstrable fact which can be tested by placing a hand upon the naked breast of a broody hen. The skin will be decidedly clammy. The absence of sweat glands—fowls cannot perspire in the ordinary

way—dispels the thoughts of perspiration, and careful investigation reveals the source of the viscous exudate. The exudate, when applied to an egg, is apparently absorbed by the porous shell, although a microscopical examination of a treated shell reveals to the observer that many of the pores are completely blocked up by the solidification of the numerous deposits of the exudate. This then is known as hen oil; but lest some enthusiastic poultry-keeper may imagine that a substitute for the natural exudate can be successfully applied to eggs undergoing artificial incubation, let me advise him not to attempt it. A few years ago a correspondent stated that by smearing vaseline on the eggs, on the fourteenth and nineteenth days of incubation, he prevented dead-in-shell; but such an idea is utterly unsound on physiological grounds and proved a failure, the vaseline arresting the respiration of the living embryos. That hen oil exists in the form of exudate from the quill follicles there is no doubt; but, so far, it cannot be applied to artificial incubation, neither has a substitute for it been discovered.

Storing the Eggs

Now with regard to setting the eggs, the nearer the new-laid stage they are when put into the incubator or under the hen the quicker will the hatch be over and the more vigorous will be the chicks, provided, of course, that all has gone well in the interim. No doubt the ideal way is to transfer them directly from the laying houses to the machines or the broody hens; but since this is seldom practicable they have to be kept some days. While they are being so held it is essential to store them in a well-ventilated place, where the air is pure, not too dry, but out of draughts, and as near as possible in a temperature of 50° F. This may not matter perhaps if the eggs are being kept for only a couple of days or so; but they must never be allowed to get chilled or overheated, and a temperature below 40° F. or above 60° F. is detrimental. For such short storage they may be allowed to lie in a natural position or be stood broad end up in a basket, which, in winter and early spring, should be lined with hay and covered with a light cloth. In this case they need not be disturbed in any way.

When, however, it is necessary to keep them for a long period—I have succeeded in hatching month-old eggs under hens—they must be very carefully stored, but in no instance must they be left undisturbed. It was customary at one time to turn such eggs completely over once *per diem*; that is, they were packed in egg boxes for convenient handling and their position was reversed once in every twenty-four hours. This method, nevertheless, was so apt to be carelessly carried out, and with such poor results at hatching time, that I abandoned it in favour of keeping the eggs stationary and broad dome up, as experiments had proved to me that a better percentage of chickens was thus obtained.

From more recent experiments I have undertaken, however, I feel certain that when eggs must be stored for a longer period than a week prior to incubation they should be kept on trays in their natural and horizontal position but rolled very gently over once daily from the start. I am not so much concerned with the actual position of the egg, because the yolk, being specifically lighter than the white, cannot sink; but when lying in trays they can be readily moved about. In any case the room temperature must be correct, while it is imperative to prevent exposure to draughts and undue evaporation, as it is also necessary to see that the air is free of poisonous gases or strong odours.

Storing eggs for incubation has an important bearing on the hatching of them. So, too, has the handling of them when they are being collected from the laying quarters. Any carelessness on the attendant's part at such a time, although it may not result in cracked shells, may very easily lead to misplacement of the yolk or destruction of the germ. I remember reading, many years ago, of a large egg "plant" in America at which all the collectors had to don overalls and wear white kid gloves. Handling eggs for hatching with dirty or oil-stained fingers has a detrimental effect on them and may well lead to poor hatches. There can be no objection whatever to the wearing of gloves when doing the egg round of the day, provided the gloves are washable and kept solely for the purpose. In fact, it is one way of ensuring hygienic eggs, untouched by hand. It is not a question of removing the bloom of the eggs but of preventing dirt getting on them.

Exercise Care in Handling

So delicate is the structure of the egg that a sudden jerk may cause the contents to become addled or render the egg infertile. This addling can also result from leaving the eggs for too long a period in the nests during frosty weather; hence the necessity for collecting them twice or thrice daily at such times. In spring and early summer, also, when broodiness is becoming evident among the layers, hens are apt to choose the most frequented nest in which to sit; and eggs left under those birds for the best part of a day are very liable to become partially incubated, so that when they are eventually collected for storing they are addled and thus rendered useless. To be on the safe side we make it a practice on the farm to do the egg round several times daily all through the year, at least thrice on winter days and five to six times at

other seasons. Not only has this the effect of preventing chilled eggs or any development of the germ, but it enables the attendant to keep an eye on the fowls and to mark down for immediate removal to the "breaking" coops any pullet or hen which shows signs of broodiness. This early removal of such birds is most beneficial during the height of the laying season, because if they are not required for sitting, they can be brought into lay again with the least possible delay.

Most novices are anxious to hatch pullet chickens, since egg production is their aim; and I am frequently asked what proportion of pullets one can reasonably expect from a given number of eggs. There is, however, no definite ratio as to the number of pullets to cockerels. Some authorities have stated that the proportion of female to male chickens in most hatches is about three to five, and others have declared that not less than four eggs should be incubated for every pullet which is required, while to be really on the safe side five eggs should be set. From practical experience extending over many years I have not found this to be so in either case. In some seasons the stern sex has predominated, more particularly perhaps among the first batches of eggs laid after mating, although in other years it has been the reverse.

A poultry-keeper of my acquaintance once hatched twelve cockerels from a dozen eggs, placed under a hen, which was certainly a very rare occurrence. The most that I have had the misfortune to get were eight cockerels and four pullets from a "sitting" of White Leghorns of a pedigree laying strain; and yet I have had as many as 100 pullets from 130 eggs incubated, ten of the eggs failing to hatch and the others producing cockerels. It is not possible to govern the matter; at least let me qualify it by saying that I have never been able to do so, since at times Nature appears to play pranks. Still, it is better to over-hatch than under-hatch—granted, always, the accommodation—because if there are more pullets than are required for re-stocking they can readily be disposed of at a profit.

The Sex of Eggs

Mentioning the proportion of male to female chickens reminds me that there are poultry-keepers who appear to be under the impression that it is possible for the specialist to detect the sex of the chick within the egg, or rather, the sex of the germ before the egg has been incubated. It is surprising how often the question is put to me: "Can the sex of the egg be foretold?" It has been declared by some people that long and narrow eggs will produce cockerels, and short and stout ones pullets, while others claim that eggs to produce cockerels have a zig-zag mark or quirl on one end and those from which pullets will be obtained must be smooth on both ends. These theories must have been put into practice by thousands of poultry-keepers, because they have been handed down and retold over 2000 years. Nevertheless this Egyptian theory still finds willing believers, even among modern poultrymen. I have studied the "sex of egg" from all angles, while, in conjunction with other authorities, I have conducted numerous experiments with that object in view; but every experiment which has so far been tried by me, or by any of my friends, has been a failure.

At one time there were on the market what were known as sex detectors; but while they were said to be reliable when applied to eggs, they were absolutely useless in my hands. And for a very good reason, because no one can foretell what sex of chick an egg will produce. Fertilization of the ovum and the determination of the sex have nothing whatever in common with the shape of the shell, which owes its geometrical form to the highly sensitive shell-secreting portion of the oviduct. Fertilization occurs in the highest reaches of the oviduct, before the yolk sac is coated with albumen, hence the process of fertilization cannot materially affect the shape of the egg or the texture of the shell. If the sex of the germ plasm in the egg could be detected, and it were possible to pick out of strongly fertilized new-laid eggs those which would produce pullets and none other than pullets, it would be of inestimable value to many breeders of utility stock, because cockerels of the laying breeds, unless they are pedigree-bred and are being developed specially for future breeding pens, are seldom worth rearing, their value as table chickens being so low. But it has not yet been done.

Neither is it possible to control the sex by special mating, and all the speculations as to the production of either sex at will are, I submit, nonsensical. To the student of embryology the fallacy is apparent. Up to the seventh day of incubation the embryo chick is hermaphrodite; it contains within itself the elements of both sexes. After this stage in one direction, one set of organs is developing and the other diminishing, according to whether the germ is going to produce a male or female chick. So that, if the germ is going to produce a chick—it may perish at some period of incubation—it would not know at the sixth day which sex it would be ultimately. That is what embryologists have discovered. Admittedly, there are some people who believe that the sex is determined by Nature from the time the spermatozoon enters the germinal disc. But there is no foundation for such a belief. I recollect a rare case of a breeding pen which produced all pullets from the first year's mating; but the same pen—no change in the male or the females—

in the second season's mating produced a small percentage of cockerels, while in the third mating there was an equal number of cockerels to pullets. The man who can produce either sex at will from fowls is assured of a fortune.

Detecting the Germ

Another subject on which my advice is invariably sought during the breeding season is whether it is possible to detect the germ in a new-laid egg, that is, whether anyone can absolutely guarantee such eggs as fertile. No one can guarantee fertility. The germinal vesicle is a simple, small amoeboid cell—invisible to the naked eye—and it is embedded in a minute quantity of semi-transparent matter of a lighter colour than the yolk. The germinal vesicle occupies a small area in close proximity to the surface of the yolk, and owing to the semi-transparent matter near the surface a round white spot is formed. This spot is popularly termed the "tread." The opinion held by many that the male contribution is visible in a new-laid fertilized egg is entirely erroneous. Therefore, it is a fallacy to suggest that an egg is fertile because it exhibits a prominent visible area of pale yolk in which the germinal vesicle is suspended.

If a new-laid egg be carefully opened it will be noticed that there appear to lie within the albumen two twisted portions of rather white substance. One of these objects rests against the yolk, while the remaining portion travels towards the adjacent pole of the egg. These structures are the *chalazae*. The embryo does not develop out of either of these portions of the egg. This can be proved by opening an egg after twenty-four hours of incubation, when it will be found that the *chalazae* are unaltered, yet the embryo has appeared in quite another part. The *chalazae*, in fact, are simply made of thickened albumen; they contain no germ cells whatever. The male germ cell (spermatozoon) never comes in contact with them, and, of course, they cannot produce the embryo. The primary function of the *chalazae* is to act as a sort of spring to reduce to a minimum the vibrations of the yolk (to whose surface the vital germ area is attached) and to support the yolk. The *chalazae* do not, and cannot, play any direct part in the formation of the chick embryo. These structures are merely masses of albumen, and nothing more. They contain neither male nor female germ-cells, and they are, in fact, formed after the vital germ cells (from which the embryo is to spring) have been completed and "closed" to all external communications. Their use is simply that of support and, concurrently, of a spring.

The male contributions (spermatozoa) are very minute organisms, visible with the aid of a high-power microscope only; and very little evidence of the presence of a spermatozoon in the egg can be obtained unless the egg is incubated for a period of three hours. After three hours' incubation the result would be suitable for microscopical, but not unaided, observation. Fertilization occurs only when the spermatozoa are introduced to eggs devoid of the albumen or "white" covering the yolk-sac. In other words, if an egg is not brought into contact with the spermatozoa in the higher reaches of the oviduct before the yolk is enveloped in the "white," the spermatozoa are debarred from access to the germinal vesicle by the presence of the resistant albumen. Hence that egg is infertile. It may be as well, perhaps, to describe briefly how eggs are formed. In fowls the female organs consist of a single ovary and a single oviduct, which are situated in the left area of the body cavity. The oviduct is a muscular tube capable of distension, and its average length is twenty inches. It is well supplied with blood-vessels and contains active secretory glands, while that portion of it in close proximity to the ovary is equipped with a funnel-shaped orifice.

How Eggs are Formed

The ovary consists of ova in different stages of development and embedded in a mass of tissue. In the baby pullet it may be said to resemble herring-roe, but in the bird on the point of laying it is more like a bunch of grapes. The diameter of the ovum in its earliest stage is approximately $\frac{1}{250}$ in. When, however, it is mature, ripe and ready to escape from the ovary and descend into the oviduct, it has grown to the size we are familiar with in the round yolk of the egg. This enlargement is due to the accumulation of the food yolk, or yellow constituent of the egg.

Its descent into the funnel-shaped orifice of the oviduct occurs in the following manner: The accumulation of food yolk causes distension of the capsule enveloping the ovum, with the result that the capsule separates from the remainder of the ovary until it is held only by a small stem-like structure. The two membranes forming the capsule are held together by means of connecting tissue and blood-vessels, which join a band or stigma formed during the development of the yolk. When the requisite amount of yolk is collected the capsule gives way along the edge of the stigma, and the contents are deposited in the funnel of the oviduct, the empty capsule being absorbed into the source of its origin. As soon as the ovum enters the oviduct it is enclosed in a very fine membrane known as the vitelline membrane.

When the mature ovum has left the ovary—and in the case of a fertilized egg has received the male contribution—it is conveyed with a rotary motion by means of tubular contractions towards the *cloaca*. The contact of the ovum (yolk) with the membrane

lining the oviduct produces a glandular exudation, first of a heavy layer of albumen, which is deposited upon the vitelline membrane (skin covering the yolk) and is extended fibre-like from each axis. These threads of albumen, as we have seen, are the *chalazae*, and the heavy layer of albumen with which they are connected is the *membrana chalazifera*. As the egg slowly rotates in the oviduct the *chalazae* become twisted in opposite directions, and the one next to the small end of the egg finally adheres, more or less, to the membrane lining the shell at that region. As the egg reaches the more vascular part of the oviduct, two other layers of albumen are secreted and deposited upon it. Each of these is more fluid than the preceding layer. When the narrow region of the channel is reached two heavier deposits of albumen are added and form the base upon which the shell material is placed. Having acquired its ovoid shape, and with the smaller end towards the *cloaca*, the egg enters the shell-forming chamber. The glands here secrete and deposit upon the egg a thick white fluid, which hardens into minute flakes, and forms the shell. All these gradually-forming envelopes and processes protect and feed the embryo during formation.

The minute flaky pieces of lime which form the shell resemble damp parchment in appearance and consistency. It is gradually hardened and shaped by a process of moulding until the egg is complete and ready for laying. The egg is retained for some twelve to eighteen hours, during which time the shell becomes hard. After that, the fully-formed egg, surrounded by its shell, is expelled from the dilated portion of the oviduct, passes out through the *cloaca*, and is laid. The shell is hard before it reaches the air. It is a mistake to imagine, as so many novices do, that the shell is soft until it is laid and gets into the air. If it is soft when laid it will never harden. And it is soft because it is abnormal—it does not contain the proper amount, if any, of shell-forming material.

The process of the egg during incubation is worth noting. The yolk is lighter than the albumen, hence it always floats to that part of the egg which is uppermost; and the lightest part of the yolk is that occupied by the *cicatricula*. That being so, the germ is always near the warmth of the hen—in natural incubation. The *chalazae*, already mentioned, keep the germ from coming into contact with the shell, and also prevent its being bruised.

During incubation the albumen disappears before the yolk. The reason for this is interesting. About four days after incubation has commenced, an admixture takes place between the two, the yolk changing colour, becoming pale, and altering in shape. In the egg to the thirteenth day, a part of the albumen lies at the bottom of the shell in a gelatinous-thick state, and more or less attached to the yolk. A rupture occurs, and through this opening the white enters and mixes with the yolk. The dense albumen mentioned above closes the opening as a valve, by which ingress alone is allowed. This may be best seen about the fourteenth day. Afterwards the opening gets smaller and is finally closed. The "chick" is nourished from both the yolk and the white in the shell.

Chick Embryology

As soon as the necessary heat is applied to an egg —assuming it is fertile—germination commences and steadily proceeds until the perfect bird is formed. Just how the germ develops in the egg was described in some observations made by a rising young biologist with whom I was closely associated in post-mortem work during pre-War days; and I cannot do better than quote from those observations.

During the first twenty-four hours of incubation the embryo develops those parts which afterwards become some of the leading organs of the body, namely, the head, the vitelline veins, and the neural fold and groove. If an egg be incubated for a period of twenty-four hours, and then tested with the aid of an egg-tester, the first visible change in the round germinal disc is that the cells at its edges multiply more briskly, and form darker nuclei in their protoplasm. This gives rise to a dark ring, more or less sharply set off from the lighter centre of the germinal disc. From this point the latter takes the name of the light area, and the darker ring is called the dark area. The circular shape of the area now changes into elliptic, and then immediately into oval. One end seems to be broader and blunter, the other narrow and more pointed; the former corresponds to the anterior, and the latter to the posterior section of the subsequent body.

At an early stage an opaque spot is seen in the middle of the clear germinative area, and this also passes from a circular to an oval shape. At first this shield-shaped marking is very delicate and barely perceptible; but it soon becomes clearer and stands out as an oval shield, surrounded by two rings or areas. The inner and brighter ring is the remainder of the pellucid or clear area, and the dark outer ring the remainder of the opaque area.

After a period of thirty-six hours' incubation the first blood-vessels, the heart, and the first blood itself are formed by the vascular or gut-fibre layer. But it must not be understood as if all the blood-vessels come from this vascular layer, or as if the whole of this layer were taken up only with the formation of the blood-vessels. Blood-vessels may be formed independently in other parts, especially in the various products of the skin-fibre layer. The heart lies at first in the

ventral wall of the fore-gut, by which it is connected for a time with the wall of the body. But it soon severs itself from the place of its origin, and lies freely in the cavity known as the cardiac cavity. For a short time it is still connected with the gut-wall by a thin film of tissue. Afterwards it lies quite free in the cardiac cavity, and is only directly connected with the gut-wall by the necessary blood-vessels which issue from it.

In conjunction with the heart two arteries are developed which give off at right angles four or five branches, and these pass from the embryonic body to the germinative area; these branches, the vitelline arteries, represent the first beginning of an embryo's circulation. Thus the first blood-vessels pass over the embryonic body and reach as far as the germinative area. At first they are confined to the dark or vascular area; but they afterwards extend over the whole surface of the embryonic vesicle. In the end the whole of the yolk-sac is covered with a network of veins. The function of these vessels is to gather food from the contents of the yolk-sac and convey it to the embryonic body. The circulatory system increases in size with great rapidity, and at the end of the third day of incubation is nearly complete. Poultry-keepers should note carefully that for the embryo, the third day of incubation, whether under a hen or in any artificial appliance, is a most critical period; and if statistics were gathered concerning deaths in the shell in the early stage of incubation, it would be found that a larger percentage occurred about the third day than at any other period.

About the seventh day of incubation the embryo contained in an egg assumes the shape characteristic of the chick. From the seventh day onwards the whole process of germination is devoted to expansion of the already existing organs. Therefore it is only necessary to note a few of the more important changes which take place, bringing about the distinctive type of the species and variety.

During the ninth day the feathers begin to appear and by the thirteenth day they occupy many regions of the body to the length of about $\frac{1}{16}$ in. These minute feathers are enclosed in gelatinous sacs, which do not break until the moment of hatching. It is during this period that the mandibles begin to form, and they can be recognized as nodules of substance, chalk-like in appearance, which by the twelfth day have developed into a soft horny beak. On the thirteenth day the nails are visible, which, together with the head, are considerably hardened by the sixteenth day of incubation. On the fourteenth day, however, the embryo moves its position so that it lies lengthwise in the shell, and its beak is brought into contact with the inner shell membrane. The embryo takes up this position in order to facilitate its egress from the shell at the proper period; and unless it attains this position it will probably be unable to make its exit.

How the Chick Emerges

About the twelfth day the chick will be seen to occupy the whole of the shell except the air space. The yolk will be almost entirely absorbed by the fourteenth day, the walls of the enveloping capsule being loose and flabby. Previous to hatching, the yolk is drawn into the body, the walls closing over it at the *umbilicus*. This absorbed yolk serves to supply the chick with sustenance for a period of twenty-four to thirty hours after hatching. When ready to emerge, the chick raises its head, and with the aid of its "egg-tooth" pierces the membrane holding it captive. When this membrane is ruptured the chick is enabled to breathe the air contained in the chamber, which causes the suspension of the embryonic circulation and the pulmonary circulation to become active. The head is then raised into the air chamber and the chick deals blows upon the shell, which, when repeated in the same area, result in fracturing it. This process is continued until the aperture is about half an inch in diameter, when the chick presses with its head against the large end and its feet against the small end, and then by exerting itself is able to throw off the shell lid and emerge from the shell.

The period of incubation is twenty-one days; but if the eggs are strictly new-laid when set the chicks are generally out by the end of the twentieth day. In the usual course of events the egg is "starred" on the nineteenth day of incubation, and under normal conditions the chick is hatched within eighteen hours. It may be as well to mention that the shell is not broken by a cutting or scraping motion of the beak through the agency of the pointed horny scale or "egg-tooth" at its end. It is broken bit by bit, and with apparent ease by a healthy chick, and generally by one single smart blow, although in some instances the blow is immediately repeated. In the normal course, each stroke of the beak is made with considerable power against the shell, as can be readily ascertained by placing the ear against the part while it is being broken.

When the period of hatching approaches, the chick, which previously had occupied only about two-thirds of the space within the egg, raises itself in the shell by a struggling movement, and by thus unpacking itself, as it were, acquires more liberty for its efforts of liberation from its shell. The shell is always broken from right to left because the chick is so packed in the shell that its head reclines under its left wing and on the left side of its body. It can, therefore, only work and turn with facility towards that side.

When first hatched the chick appears damp, because its minute feathers are still in their gelatinous sacs; but the warmth it receives when under the hen or in the drawer of the artificial incubator soon dries it, and by the end of twelve hours or so it presents the fluffy appearance so much admired by womenfolk.

Hen-hatched and Incubator-hatched Chicks

Even though it is said that artificial incubators are just about as fool-proof as they can be made by man, and so simple to operate that a child can manage them—which is certainly not so in practice—there are many poultry-keepers who prefer natural to artificial means of hatching chickens. Especially is this so when pedigree-breeding is being undertaken, or when chickens are being reared for stock rather than for market or egg production only.

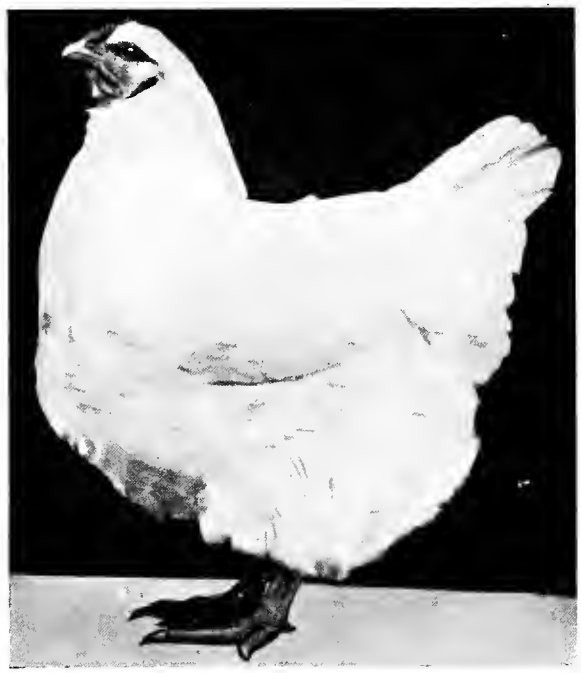


FIG. 86. A LIKELY HEN FOR SITTING

Although the White Wyandotte shown above is an exhibition specimen, hens of this type, no matter what their breed or cross, should make ideal sitters. The plumage of this one is particularly soft and abundant, while her thigh fluff is profuse and her legs are short—all good points in a sitting hen

It is thought by some poultry-keepers that a hen hatches a higher percentage of the eggs than does an artificial incubator; but if the machine is well designed and properly managed I do not think this will be found to be the case. I have seen it stated, also, that a hen raises better chickens; that they grow harder and more vigorous, are more solid in the hand, and that they feather in a better manner. This is not my experience, because these points depend upon breeding and general management, which includes feeding. Where, however, the hen does score over the artificial incubator is in the hatching of stored eggs, those which have to be kept for some weeks prior to being set. I have frequently succeeded with month-old eggs placed under a hen, but seldom have I done so with eggs of a similar age put into an artificial incubator.

Now with regard to natural hatching; the most suitable birds to select for sitting are second-season or older hens of large size and a quiet disposition and, what is perhaps more important, those which are accustomed to being handled. It is possible to use pullets for the purpose, birds of nine to ten months of age which have laid their first small batch of eggs and taken to the nest. As a rule, though, it is much more desirable to break them of their broodiness and bring them into lay again than to let them take a rest for two months or more over hatching and rearing. As it is, such young birds are generally unaccustomed to being handled, while their period of broodiness is often so short that they are very apt to come into lay again before their chickens are of an age to fend for themselves, which means that the youngsters will be neglected. For these reasons, therefore, I greatly prefer seasoned hens to pullets for sitting.

The Best Sitters

Although big birds should be chosen, they will be the more useful if they are not too loosely feathered. If short-legged so much the better, because they are then less liable to suffer from cramp during their spell of sitting. It is advisable, also, to discard fowls with heavily feathered shanks and feet, as such hens are generally clumsy and likely to break the eggs or to smother the chicks. Many a farmyard mongrel has proved to be an ideal sitter when properly managed; and it is certainly not essential to select only pure-bred stock for the purpose.

The important point is to choose a docile hen and one which is thoroughly broody. When a hen is getting ready to sit she will spend much of her time on a nest in the laying house, generally leaving it only at the accustomed meal hours, although almost as soon as she has completed her batch of eggs she will probably remain on the nest altogether—and a thorough nuisance she is to other birds which wish to lay, because the clucker almost invariably selects the favourite nest box. However, if approached by the attendant she will ruffle her feathers and squall, while, given the opportunity, she will peck viciously at his hand. When removed from the laying nest and put into the run or on the floor of the house she will appear somewhat dazed for a few moments; but if disturbed she will begin clucking and move with her whole plumage fluffed out. Should the hen have returned to the nest

when the attendant visits the laying house in the evening, he can depend upon her being thoroughly broody; and she will be found well settled down the following morning. If her services are required, therefore, she should be well fed and exercised and then transferred to the nest it is intended she shall occupy for the period of incubation. Let me caution the poultry-keeper not to handle such birds roughly, because if they are thrown off the laying nests each time they are found there it will thoroughly upset them, and they will not make good sitters at the desired time.

It is perhaps annoying to have pullets falling broody during the winter laying season when egg prices are high; but if not required for sitting they should be encouraged to continue production. This can be done by confining them to outside coops which are attached to the houses or, preferably, coops put in a special section so that, when the birds are numerous, they can be attended to without upsetting the daily routine. My "breaking" coops are 4 ft. long by 1 ft. 6 in. wide, 1 ft. 10 in. high at the back and 2 ft. 3 in. in front. This latter consists of spars 2 in. apart, two of them being fitted with slots to act as the door; and there are brackets to take a food trough the whole length. The floor is slatted from end to end, and a droppings' tray is fitted under it. For our convenience in attending to the cluckers the coop stands 4 ft. from the ground, and it accommodates up to eight birds. Hens will not settle down to broodiness where they cannot generate heat; the slatted floor permits free circulation of air.

The fowls are fed and watered as if they were in lay; and they are supplied with green food, grit, and shell-forming material. I find that heavy feeding has the effect of getting them fit again, while starvation rations delay egg production. As a rule a week's confinement is sufficient, but only when the birds are taken out of the laying house at the very first sign of broodiness. The sooner the remedy is applied the shorter will be the period of delay; if they are neglected for a week it may well be about a month before they get back to laying condition.

When and Where to Set the Hen

However, to return to the setting of the hens. The best place in which to accommodate them is an open-fronted shed with an earth floor. There is no need to make the shed dark and stuffy, even in winter; but the hens must be protected from draughts, while their nests should not face the light. I have remarked that a hen which steals her nest in a hedge bottom and leaves her eggs exposed to the air generally brings off a good brood of chickens. It must be remembered, though, that this natural hatching is done during late spring or early summer. Hence, while it may be very desirable to take a lesson from Nature, it would be most unwise to adopt such open nests in winter. I must admit that hens have been set in a disused stable, cowbyre, coach-house, cellar, and wood shed. I have even allowed them to sit in the laying boxes on the floor of the ordinary roosting house. Nevertheless, it is a very slip-shod way, this latter, if merely because the sitters are apt to be upset by birds which are anxious to lay, while there is often trouble when

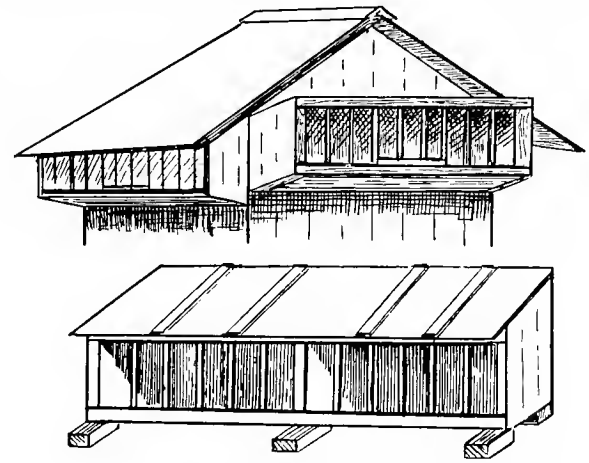


FIG. 87. "BREAKING" COOPS

Outside coops, for breaking pullets of broodiness, can be fitted under the eaves or at the end of an ark (as shown at the top) or be entirely distinct and set on bricks. In this latter case—a two-compartment coop is shown—none of the bars is movable, the birds being handled through trap-doors in the roof. The floors can be of slats or wire-netting; they must not be solid

the broodies leave their nests to be fed. Much better, therefore, keep the sitters by themselves in a special place, and where they are not likely to be unduly disturbed.

Personally, I prefer to provide each bird with its own sitting compartment than to permit the hens to sit where they are exposed. A row of these nests can be arranged, half a dozen or more, about 1 ft. 6 in. high, and each with a 1-ft. square floor space. This latter is somewhat important; if less is allowed the sitter is very apt to get cramped by being unable to shift her position, and she will probably break some of the eggs. On the other hand, with much more room at her disposal, when in, for instance, an 18-in. square compartment, she can—and in such circumstances some hens do—get into a corner and cover only a few of the eggs. There is no need to put a wooden floor to these nest boxes, but if there is any likelihood of trouble from rats they could be placed on some $\frac{1}{2}$-in. mesh wire-netting, or the netting secured across the bottom and brought 2 in. or so up all round on the outside.

The boxes should be solid, except the fronts, which

should consist of a 3-in. high board at the bottom (to keep the nest material in place) and a door made of wire-netting or bars, over which I hang a piece of light sacking. Each top or roof should be in the form of a lid, not hinged, as it is much better to lift the hen off than to drag her from the nest, if she will not leave of her own accord. If an earth floor is not available, make one of earth and cinders rammed hard; or in the case of bricks, concrete, or cement, first cover it with a stout sack. I have seen sitting boxes in tiers, and also put on shelves; but in such

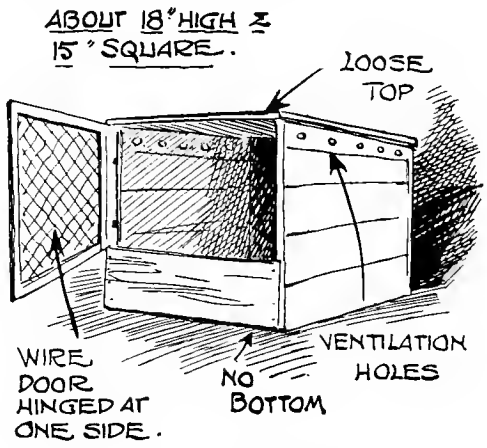


FIG. 88. A GOOD TYPE OF SITTING BOX

places the nests generally become too dry to be serviceable.

When the apartment is in position put in a shovelful or so of well-sifted earth, and beat it together, concave or saucer-shaped, but not as deep as a pudding basin. Be careful to remove any stones or hard lumps, and to pack the four corners so that eggs cannot roll into them. Make the centre and sides in such a way that the eggs will keep together without being unduly close, because the hen's legs must rest on the ground, and she must cover all the eggs when she spreads out her wings. Over the earth put a very thin layer of hay or well rubbed straw, but chopped into short lengths and not whole. Nests are sometimes made of hay; but I find that it encourages insects which are apt to irritate the sitter.

Employ Clean Birds

I may mention that some poultry-keepers dust their hens with insect powder prior to setting them, and also sprinkle the powder over the nest material. As my fowls are allowed to dust themselves freely in the earth, not only when in the laying pens but during their period of sitting, I have rarely found it necessary to powder them; and I should certainly hesitate so to dust a hen I was about to set, although a dusting under the hay or straw would do no harm. It would, admittedly, be most unwise to use a hen infested with lice, because such a bird could not possibly be a steady sitter, while any chicks she hatched would start life with a disadvantage.

Hence, set only clean hens, and, moreover, those with smooth and not rough scaled legs. Most authorities insist that a broody hen should be put on the nest at night, so that if she is really settled down the next morning she can be taken off, fed and watered, then given the eggs she is to incubate. When, however, a hen had made up her mind to sit, and I wish to utilize her for that purpose, I remove her from the laying house at breakfast time and let her eat, drink and dust, while I get the nest and the eggs ready. She is taken into the shed direct from the house, and almost invariably of her own accord she goes on to the nest which has been prepared for her. Occasionally a hen has to be coaxed to take up her fresh abode; but in no case would I drive her on. Once or twice I have done so; but always with the same result—the bird was found standing on the eggs and would not sit on them.

When the hen has settled down, which I ascertain by taking a peep at her a few minutes after shutting her in, she may safely be left for three days. That is, during the first three days of incubation she need not be taken off. The meal she gets before she takes to the nest, a good cropful of wheat and small or kibbled maize, will enable her to sit as Nature dictates. Of course, it is essential before she is allowed to sit that she gets a full meal, because she will not settle down contentedly if she is hungry. I have often set a hen in a small box and wired-in run, and allowed her to leave the nest whenever she liked; but I seldom, if ever, recollect a bird doing so during the first two or three days. It used to worry me at one time; and yet, if I removed her, she would refuse to eat and seemed always anxious to return to the nest. After the third day, however, the hen must take a good meal daily. I have mentioned setting the hens in the morning. This is because it is the custom of our farm to remove any broody hens from the laying house at the breakfast meal, either for transference to the breaking coops or to the shed for the sitters.

It is a good plan to set several hens at the same time, so that when the chicks are hatched they can be divided between two or three hens and the others set aside for generous rations to bring them into lay again. I do not hesitate to give a docile hen as many as twenty chickens—or ducklings—to rear, and especially in the spring. This reminds me that so far I have not indicated how many eggs should form the nest. This, naturally, depends on the size of the hen and the time of year. Except in winter—it is sometimes

possible to have a few broody hens then—a large bird may safely have fifteen eggs entrusted to her—hen eggs, because the maximum would be ten duck, five goose, or nine turkey eggs. In winter, however, I would not exceed nine of the first-named. By giving a sitter more than she can adequately cover and tuck well under her plumage—and they must be right out of sight when she has settled down—the eggs do not get an equal share of her heat; in fact, all may at one time be deprived of the bird's warmth and fail to hatch. There is another reason against large numbers in winter, and that is, even if the whole of the eggs were hatched, there would be a risk that the chicks might not be reared by her. When they reach the age at which they are feathering, a time when chickens require more warmth, the hen cannot cover them; consequently some will perish from chill. It is, therefore, unwise to attempt a large number of eggs as a nest in winter.

Damping the Eggs

Some authorities advocate pouring water freely on the ground around the nest boxes while the hens are sitting, so as to keep the soil moist, "just as a stolen nest is kept moist all round by rain." But this is pure theory, because many hens sit in stolen nests when rain has been absent for weeks, and, moreover, these hedge-bottom nests—of which I have examined many —are perfectly dry as a rule, and so fashioned that, except during a very heavy downpour, no rain can reach them. A hen which uses such a nest would probably return from her daily forage with a certain amount of dew on her legs and breast feathering; but this damping of the eggs is altogether different from what would amount to soaking the nest if water were poured freely around the sitter's box. It is rarely that eggs require damping while they are being incubated by a hen in a nest such as I have described; but should there be occasion to do so, then the damping could be done by means of a scent-spray, and only during the last three or four days before the chicks are due, warm water being used. This, nevertheless, is necessary only in very dry weather or during the prevalence of east winds.

It is the custom with some poultry-keepers who set several hens at the same time to liberate them together daily. One has told me that he always sets at least three hens at a time and lets all of them off together into the same small run. He says that they never fight and he has never known them to do so, but that they encourage each other off the nests to eat, and then on them again. Docile as are the hens which I set I have never found it advisable to allow more than one off at a time, because when I used to have a small wired-in pen attached to each nest box and let the hens off their eggs, they spent most of their time in quarrelling. I have seen as many as 200 hens sitting in the same shed and liberated to feed just as quickly as their boxes could be opened; but each bird was pegged out, that is, one leg was attached to about twelve inches of fine cord which was fastened to a peg at a distance that prevented fighting. Even then, though, peace did not always reign supreme, as more than one hen would prefer fighting to feeding. At any rate, when hens are being used for incubation it is much preferable to release them singly for their exercise.

A Daily Airing Necessary

As it is essential that the eggs be aired daily, the hen must be allowed to leave her nest once during the twenty-four hours after the expiration of the third day. And, of course, she must be permitted to eat, drink, dust, and stretch her legs. Constant sitting entails lack of exercise, and that is very apt to result in constipation. If, therefore, there is any difficulty in this direction the hen should be lifted from the ground and dropped gently on her feet. To overlook this matter may lead to her fouling the nest; hence it is advisable to see that she obeys Nature's call before she returns to the eggs. Do not, however, unduly excite her or she will become obstinate. She must not be fed on the nest; so if she is disinclined to leave her eggs, take her gently off and shut her out. For this purpose I long since made my sitting boxes with lids; it enables me with ease to pass a hand around each side of the hen and, before lifting her, to ascertain that she is free of the eggs. This must be watched, because some eggs may become fixed under her wings.

During the early part of the season, ten minutes to a quarter of an hour *per diem*—and as near as possible to the same time each day—will be long enough for her to be free; but towards the warm weather she may be off for half an hour or so. As a rule, though, the hen will know when to return. While she is sitting, her food should be corn only; that is, she should not be given any wet or dry mash. Wheat, barley and small or kibbled maize are the best kinds of grain. Grit, clean drinking water, and grass should be available, or, failing grass, a small quantity of finely chopped cabbage or other fresh green food may be put down for her. Wet mash is very apt to result in her fouling the nest. If this should occur—or should an egg get accidentally broken during the first few days—the eggs will have to be cleaned and the nest remade. At any rate, any filth must be wiped off with a flannel dipped in hot water and wrung out almost dry, although in the case of egg material which has dried on the shell I do not hesitate to scrape it gently

off before using the flannel. Any part of the nest which is soiled should be taken out and replaced with fresh material. It is as well also to see that the hen's legs and feet, and her breast feathers, are free of any extraneous matter, so as to avoid the possibility of eggs adhering to her (and getting broken) the next time she is taken off the nest.

Well-tended broody hens give little if any trouble at hatching-out time. They should have grown accustomed to their feeder during the many days they have been sitting on the eggs; so if he has exercised the amount of patience which is almost invariably necessary to secure docility among the sitters, they can be left very much to themselves from the nineteenth day until the hatch is over. Some eggs generally commence "starring" on that day, and all should be "starred" on the twentieth day at latest; and under normal conditions the chicks should appear within eighteen hours of their first tapping their way out. So when the hen leaves her nest for the last time see that she gets an extra good meal; and allow her to indulge in a dust bath. Never mind if she takes half an hour over it.

Tending the First Out

During the early part of the season, especially when only one pen of fowls is being bred from—or at other times when the breeder wishes to set eggs from one particular hen—there may be a considerable variation in the ages of the eggs when they are put into the nest. Some have to be stored until there are sufficient to make up two or three nests; and as a result of this some of the chicks will probably be out of their shells a few hours prior to the others. These early birds are likely to be in the way, and if the hen does not turn them out of the nest—as I have experienced on one or two occasions—they are very apt to get squashed, and may even prevent other chicks leaving their shells. In such circumstances I never hesitate to visit the nests on the twentieth day, in the morning and again at night, to remove them from the nest and keep them in a temporary dryer until such time as I consider the hatch should be completed. This means preparing a foot-warmer—a stoneware or aluminium "bottle" in preference to the flat rubber kind—filling it with hot water, wrapping it in a piece of house-flannel, putting it in one section of a small pilgrim basket or some similar receptacle, and keeping it indoors, generally in the kitchen. It does well as a "mother."

This transference is especially necessary in winter, bothersome though it may be to some members of the household; but I have lost more than one sturdily-hatched chick through leaving it in the nest when it was out well ahead of the others. And early-season pedigree-bred chicks are too valuable to lose through lack of a little extra trouble. Care has to be taken to prevent such chicks getting chilled in the transfer to and from the house; but I manage it safely by putting them in an old tweed hat I invariably wear on such occasions, although a box lined with hay would answer just as well. Otherwise at hatching-out time a reliable hen can well be left to herself; she knows what to do and can be depended on to do it.

All the same, it is as well to visit the nest once or twice, because all sitters do not remove the empty shells, which sometimes get fixed over eggs which have starred and thus prevent those chicks entering the world. Better, therefore, have a look at the hen, if merely to take those empty shells out of the way. It is an easy matter to insert a hand gently under her for that purpose. There may be hens which resent such interference; in fact there are, as I have noticed on occasions. But, perhaps because I have been almost brought up with poultry—I can recollect them in the old home, and prize stock, too, when in my toddling days—I never find it difficult to get other folk's broody hens accustomed to being handled by me. However, when the earliest hatched chicks have to be taken into the house, do not return them to the hen until the hatch is over, when they can be put under her after she has been out to stretch her legs, and has had a good meal. They can be left together in the sitting box for the next day, during which time the rearing coop can be prepared for them.

Testing the Eggs

When the hen has taken to her nest many poultry-keepers do not care to handle the eggs; but no harm will be done if they are carefully tested. In fact it will prove beneficial rather than detrimental, because any clear (infertile) eggs should be removed for use in the house, as they are then perfectly wholesome. Moreover, infertile eggs cannot generate heat, although they absorb it; hence if they are left in contact with "live" eggs they will cause the latter to lose some of their own heat, which will be detrimental to the developing embryo.

It is customary to test the eggs on the seventh day of incubation, although it is better for the novice not to do so until the tenth day. The eggs should be held in front of a strong light between fingers and thumb lengthwise, and with the eyes shaded. Proper testing lamps can be obtained of most appliance makers for a small sum, and they are decidedly handy. Otherwise cut a hole, the shape and size of an ordinary egg, in a piece of cardboard, and hold this between the light and the eyes. If all has gone well and the embryo is developing, it, with the encircling membrane, presents the appearance of a semi-transparent circular

spot floating at the top of the egg when held sideways; and at the seventh day it extends over nearly one-half of the interior surface of the egg. If the process of incubation is perfectly satisfactory this "spot" floats round in the egg when the latter is gently turned in the hand.

Should the embryo apparently adhere to the shell when the egg is first examined it will probably free itself as the egg cools. It is at this stage that what is sometimes described as the "spider" can be seen —a dark body of irregular shape with a number of blood-vessels radiating from it. A few days later the enveloping membrane expands still more, thickens, becomes more opaque, and is covered with minute blood-vessels. The egg then presents throughout the greater part of its surface an opaque appearance; but the small end and perhaps a part of one side are so far transparent that the light can be seen through them. This, however, gradually decreases until at about the sixteenth day the egg is quite black and opaque, except at the large end, where the air vesicle, now considerably enlarged, is distinctly seen, the division between the solid substance and the air space being plainly defined. If the egg is infertile the light will shine directly through it without interruption, and its appearance will be as clear as that of a new-laid egg; but if, under the test, a general cloudy effect is observed, with perhaps darker blotches or spots here and there—and on moving the egg from side to side the cloud revolves—it indicates a broken yolk, which means that the egg is useless.

Dead germs are much more difficult to detect at the seventh day, because their appearance varies; but when the embryo adheres to the shell, or irregular thin red lines adhere to the membrane of the shell, or a yellow line is observed inside the egg and following its shape, it can be taken for certain that the egg is unhatchable. Experience is required to test eggs so that no mistake is made; but it is a point worth studying and will repay for what few losses it may occasion at the beginning. It is particularly beneficial to have such knowledge if the poultry-breeder is dealing in hatching eggs, because to test them early in the season gives him a good idea of how the stock birds are mating and indicates if any change should be made in the pen. It also enables him to check up any eggs which may be returned to him as infertile —so many beginners imagine that an egg is infertile if it fails to hatch. Moreover, clear eggs, tested out up to the tenth day of incubation, may safely be used for household purposes, while if left under the hen they, as well as those which are addled, lower the temperature of the fertile eggs. When testing eggs in winter cover the nest with flannel to prevent chilling.

Assisting the Chicks to Hatch

Just one more point before leaving this subject of natural incubation. Eggs which are not "starred" by the twentieth day may be tested in a bowl of hot water. When first put in—and it must be done very carefully—some will probably sink and others float; but after a few seconds any of the former which contain live chicks will show signs of movement. As they do so they should be gently removed, disturbing the water as little as possible, and replaced under the hen. Those which do not exhibit signs of life after ten minutes should be examined under a strong light, and, if quite opaque, marked, returned to the nest, and

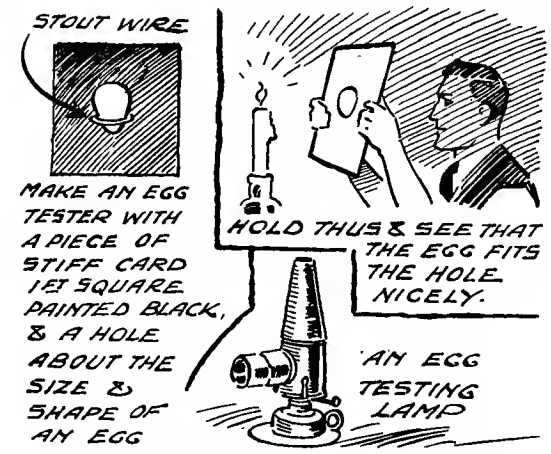


FIG. 89. TESTING THE EGGS
A simple egg-tester is all that one requires when dealing with eggs which are being incubated by hens

opened when the hatch is over. Part of the shell at the broad end should then be removed with the point of a penknife, and warm water dropped on the membrane. This will become transparent, and if the chick be alive but not quite ready to make its exit, the blood-vessels may be seen; but if there is no blood the chick is either dead or ready to hatch. The shell may then be farther broken, when a touch with the finger will be sufficient to indicate life or death; and in the former case enough shell should be removed to allow means of egress. When eggs have thus to be broken they should be put into an artificial incubator and not under a hen, because in the latter instance they will almost invariably get crushed.

Some authorities advocate killing chicks which cannot leave their shells without assistance, because in many cases the birds will be too weak to live for more than a few hours, while if they survive they will develop into weak stock which will always be a source of trouble. It is, admittedly, much more satisfactory for the chick to hatch of its own accord, since it is a sign of vigour; but when eggs from valuable pedigree

strains are being incubated some breeders do not hesitate to render assistance when they consider it necessary. It is certainly a custom with a well-known bantam breeder of my acquaintance; and he rears quite hardy stock. I must admit, nevertheless, that when stamina is the aim, as it should be to ensure vigorous egg-producers, the chicks should hatch naturally, and any others be marked down as losses.

Artificial Incubation

There can be no doubt that the method of hatching eggs artificially is of very ancient origin. According to an Egyptian authority, the following extract is taken from the chronicles of one Diodorus, a Sicilian traveller and historian, who visited Egypt about 10 B.C.: "Of all the discoveries to which any class of Egyptians attained, the one which is most worthy of admiration is their mode of rearing fowls and geese, and by a process their ingenuity has devised they hatch the eggs, and thereby secure an abundance of poultry without the necessity of waiting for the incubation of the hens." However successful the Egyptian egg ovens of old may have been, it was not until the late 'seventies that attention was directed to artificial incubation in England.

In 1877, at the London Dairy Show—which is still being held annually at the Agricultural Hall, Islington —Messrs. Christy & Co. exhibited for the first time a "Hydro-Incubator," based on the French hot-water machines. Hence, the late Thomas Christy claimed to have brought artificial incubation into practical use in this country. Admittedly, his machine was a crude affair compared with present-day ones—heat was supplied from water tanks which had to be replenished every twelve hours—but it served the purpose of demonstrating the fact that hatching could be carried out successfully without the aid of the broody hen. It was due to the inventive genius of the late Charles Edward Hearson, nevertheless, that the artificial hatching of eggs became possible on a commercial basis, since about 1881 he invented the Hearson capsule to control and regulate the temperature. Since that date vast improvements have been made in incubation; but the capsule which was invented and patented by Mr. Hearson has ever since formed the principle by which temperature control has been regulated in incubator practice throughout the world.

It is perhaps too much to say that, even to-day, incubators are fool-proof; but it is a great mistake to imagine that they are merely a poor substitute for Nature. A reliable machine will give excellent results in capable hands; and while a steady hen is a dependable hatcher, she is far surpassed by artificial means for convenience in handling and for economy of room and labour.

As the ancient Egyptians discovered, artificial incubation enables eggs to be hatched without the necessity of waiting for hens to become broody; and as they cannot be depended on to fall into such a state at any and every day, the incubator is an essential appliance for those who have to hatch at all times of the year. As can be imagined, this is a great point in its favour when one is engaged in poultry-farming. It must be admitted that some hens do sit in winter; but it is the exception rather than the rule for them to do so, although even to-day there are, among rearers of table chickens for the earliest markets, those who depend entirely upon natural methods of hatching and rearing. This they accomplish by forcing the hens to range freely in late summer, as soon as the birds show signs of moulting, and then bringing them into the sheds in autumn to enable them to complete and furnish up from their moult. They are then heavily fed and may fall broody after producing small batches of eggs.

Successful as this method is said to be with fowls which are bred and managed almost solely for their brooding propensities, it certainly cannot be recommended as a commercial proposition, and particularly for the production of such quantities of chickens as must be hatched to meet the demand for pullets for laying. In any case, it would be uneconomical for anyone commencing on a large scale to set up the necessary appliances for natural hatching; in addition to which, the time and labour involved in attending to the enormous number of hens which would be required in such circumstances, even if an adequate supply could be obtained, render this method obsolete. Artificial means are, therefore, essential to keep costs within reasonable limits.

Choosing a Machine

Incubators, however, must be understood if success is to be achieved with them. It is a fallacy to imagine that nothing else is required beyond getting up the necessary heat, putting in the eggs, and then leaving it until the chicks should make their appearance. The operator must never lose sight of the fact that the human element plays a most important part, and that the process of incubation is a delicate operation. The incubator is not possessed of brains; it will regulate but cannot think. The thinking must be done by the man in charge. It is folly to expect to hatch without work; and the operator who imagines he will get chicks simply by trusting to the regulator to keep the heat up without attention does not deserve success. A child cannot manage an incubator, notwithstanding all claims to the contrary, for incubators

are not toys; so it is most unwise to turn over an adult's job to a youngster. If the latter must work at incubation, let him or her attend to the broody hens. I do not wish to infer that a novice need be over-apprehensive about operating an incubator for the first time, because inexperienced poultry-keepers very often get excellent hatching results, very probably because they take great care to run the machine strictly according to instructions, and to maintain an absolutely correct and even temperature.

I am frequently asked which is the best incubator. There is, though, no best. How can there be, with well over one hundred makes on the market to-day, and the vast majority of them giving satisfactory results in capable hands? As a matter of fact, it may be stated that all the standard machines can be depended on, granted common-sense management; but it is almost impossible to exaggerate the importance of getting a good incubator. Buy well; see that the material and finish are sound, and that the artificial appliance is intact in every part.

The various makes differ in construction and the manner of working; hence as they often require slightly different management it is scarcely possible for me to suggest any hard-and-fast rules for the running of each kind. All manufacturers send instructions with their incubators; so that the safest and wisest plan for the beginner is to study those instructions very carefully, and to fit up the machine according to the directions sent with it. The actual manufacturer should know best how his machines should be treated to give the most satisfactory results possible; hence his instructions are worth following closely. It must be remembered that each incubator is tested under ideal conditions before it is sent out, but that conditions for working it are not identical in all parts of the country. If, therefore, entirely satisfactory results are not obtained, the manufacturer should be consulted, or experiments made in the method of operation. No matter how much one may read, experience will be the best teacher. There are two distinct types of standard incubator, viz. the hot-water (hydro or tank) and the hot-air or atmospheric; but they vary in capacity from 25 to 3000 or more eggs. The "fuel" can consist of paraffin oil, gas, coal, or electricity, but for the novice oil is decidedly the best.

A Convenient Size of Incubator

When contemplating making a start at artificial incubation many beginners are apt to choose the smallest machine available, with the idea, of course, that if this form of hatching cannot be mastered little will have been lost in capital outlay. But as anyone with an average amount of intelligence should be able to operate an incubator with more or less success after a little study, and artificial incubation has long since gone beyond its experimental stage, it is much more economical to commence with a size which is likely to serve him for practical purposes long after he has passed out of his novitiate. For this reason, therefore, I suggest somewhere around the 250-egg size, since the actual cost of such a machine is very much less in proportion to capacity than that of the smallest make. Moreover, there is no economy in getting one that is large enough only to take the place of a couple of hens. The object of adopting artificial means of hatching is to save labour. When one is working on a large scale and a hatchery business is being undertaken, the cabinet type of mammoth incubator will probably be installed, if simply because of its greater capacity in a much less amount of space. Nevertheless, while such machines in the hands of experienced operators do undoubtedly prove eminently successful in producing a high percentage of sound chicks, they are seldom in use by commercial producers, and are certainly not the kind which a beginner at incubation should attempt to master. These mammoths are for the hatchery specialist.

Many a novice has begun with a 60-egg incubator and, until the working of it was thoroughly understood, experimented with eggs from reliable cross-bred stock. This latter is by no means a bad idea, although to attempt it with eggs of doubtful freshness from shops, in total ignorance of the conditions under which they were produced, or to fill the machine with those of foreign origin, is merely wasting one's time. And here let me remark that when it is necessary to purchase eggs for hatching it is advisable to insist that they are guaranteed from blood-tested stock. This does not mean that every egg is consequently guaranteed to produce a chick; but it does ensure that what chicks are hatched are from healthy parents, and therefore they start life free of disease, at least free of a disease which can play havoc among chickens. However, concerning the size of incubator, I think the novice may safely get his hand in with the larger machine mentioned, because it can be as easily managed as the smallest kind made, while good use can always be found for it should it be necessary at any time to increase considerably the capacity for hatching.

As it is, some poultry-keepers find it more convenient to operate ten 250-egg machines than one holding 2500 eggs, and particularly when they are hatching from different pens, although where production is moderately large it is more economical to run one 500-egg incubator than two of 250 capacity, as regards the cost of oil and labour in operation. The smallest incubators I recollect are for a score of eggs;

but they are generally used solely for testing out fertility from certain matings during the early part of the season when broody hens are not available. Few if any poultry-breeders would purchase a 20-egg type for any other purpose; but it is decidedly handy when dealing in "sittings" and, too, when one is pedigree breeding. I suggest the 250-egg size because it can generally be depended on to give satisfactory results, and, moreover, it is small enough for most purposes of ordinary production. Of course, machines of varying sizes up to 500-egg capacity are made, with a lamp heater, and they are easily operated and thoroughly reliable, because good results may be obtained with any size of a standard make. But at the beginning the 250-egg incubator will be most convenient, and with proper management it will produce a high percentage of chicks from suitable eggs. Moreover, there is the rearing to be considered; and even 200 chickens will be a large brood to look after when one is in training.

Hot-water and Hot-air Machines

As I have already remarked, there are two distinct types of incubator suitable for the novice; and although they are made to a variety of patterns, the difference is mainly in the matter of heating. But in each kind the heat is generated by means of a lamp burning paraffin oil, which oil should be of a guaranteed brand. Both types of incubator are in constant use and have given excellent results in this country; hence it would be invidious for me to make a distinction and suggest one in preference to the other. It is simply a matter of fancy; and when I hear poultry-breeders advocating one or the other type it just means that it is the one to which they have become accustomed, unless perchance they have a pecuniary interest in its sale.

In the hot-water incubator the temperature of the egg drawer is maintained by a flow of hot air through a copper tank of hot water over the drawer, the tank being filled at the top and the water being drawn off, when hatching is finished, through a tap at the side. This tank system is embodied in some of the best and oldest established English incubators. In the other, known as the hot-air or atmospheric machine, there is no water tank, hot air from the lamp being carried direct into the egg chamber, where it is spread around and among the eggs.

In most hot-water incubators ventilation is provided by means of a hole in the floor of the machine, beneath the egg drawer and by holes around the space into which the drawer fits. Fresh air enters at the bottom and spreads among the eggs; and to prevent a drying effect there is a tray for water which may have to be used, giving humidity to the air before it reaches the eggs. In some atmospheric incubators the hot air created by the lamp passes up a tube right from the burner and into a metal heat chamber over the egg tray. This heat from the lamp in no way combines with fresh air, and never enters the egg chamber. By means of hot gases from the lamp, heat is maintained in the heat chamber, which is a large flat square tank covering the whole of the top of the incubator. An outside heater is connected with the lamp, while a damper over the lamp flue controls the passage of heat into the heat chamber; the gases thus pass into the body of the tank and maintain an even temperature over the whole machine.

Fresh air is attracted to the channel or tube around the lamp flue by the heat. As the fresh air becomes warmed it passes by a distinct and separate channel right into the inner heat chamber and, through a series of holes in the fresh air tube, descends into the egg chamber; at no time does it come into contact with the lamp flue. The fresh air is always pure and always passing through the machine. Gradually the heated air inside the incubator descends as it cools, being driven down by the hot air above, and diffuses out through the bottom of the machine, the flow or passage of hot air through the incubator being regulated by the number of felts which are placed on the bottom of the nursery drawer.

Hot-air incubators are known as non-moisture machines, because added moisture is not supposed to be required under normal conditions to ensure a successful hatch. There is certainly no drying current of air passing among the eggs; hence as there is little or no evaporation no moisture tray is necessary as in the hot-water type. This does not mean that the eggs do not get moisture, as the ordinary air of the room is generally charged with it, and it may suffice. There are times, however, as for instance during hot and dry weather, when it is very desirable to add humidity to the air entering the machine, otherwise the heated air would extract from the eggs all of that element contained therein naturally, thereby arresting germination. In such circumstances, therefore, it may be necessary to sprinkle the floor with water, or, better, to fit a device to the lamp by means of which moisture is picked up before the warmed air enters the egg chamber.

One advantage of the hot-air type of incubator is that no draught is caused and it is generally easy to avoid undue evaporation in the egg. There is, however, always a very slight current or interchanging of the atmosphere in the interior of the machine. On the other hand, the hot-water incubator appears to be less affected by external temperature, and thus it is more likely to retain an even temperature. Still, it must always be remembered that, however

well-designed and constructed the incubator may be, no matter whether hot air or hot water is used, its successful operation depends upon the care and understanding exercised by the attendant. It must not be supposed that any incubator is fool-proof, or that it can be run successfully without personal attention.

A Suitable Location

One of the most important items when contemplating the artificial incubation of eggs is a suitable place in which to accommodate the machine. Locality needs little if any consideration since, while it is sometimes found that in particularly high altitudes the hot-air type of machine is not satisfactory, this does not mean that artificial incubation is impossible in such a situation. The machine should be worked in a room where it will not be subjected to draughts, or to sudden or severe changes of temperature, or to irregular or violent vibration.

Some operators favour a cellar or a spare room in the dwelling house. But even when such accommodation is available, it is generally very difficult to satisfy the insurance people that, although a lamp is burning continuously for weeks, there is really little fear of the machine catching fire. Unfortunately such accidents have occurred; and, possibly because it is their business to do so, those who are anxious to insure one's property against fire almost invariably remember those disasters. To be on the safe side, therefore, suitable as may be a spare room or a cellar—obviously not a coal cellar—it is preferable to run the machine in an outside building. This, no doubt, somewhat handicaps the beginner, because he might well hesitate to go to the expense of having a shed specially built before feeling assured that he has mastered the subject. I must admit, also, that many a good hatch has been brought off in some part of the dwelling house. It may be noted that in a living room above ground the atmosphere will be much drier than in a cellar, the air below ground level being generally more humid and less susceptible to changes of temperature, and that a well-ventilated cellar does make an admirable place for operating an incubator.

However, it is advisable whenever possible to have an incubator shed, and especially if more than one machine has to be operated. In any case, though, the room should be set aside solely for incubation and used for no other purpose. Whatever the accommodation, it is important that fresh air be admitted, but under control by proper ventilation. It is disastrous to have a severe draught around the machine, while floor draughts must be avoided. At the same time there should be nothing close or stuffy about the atmosphere; and it must be free of fumes. This matter of fresh air is too frequently overlooked; and lack of it is responsible for trouble in the form of death-in-shell and weakly chickens. A steady flow of pure air is essential; and for this reason windows should be so placed that the interior can be thoroughly aired, when necessary. If a brick building is not available and timber has to be used, it should be lined inside and thus have

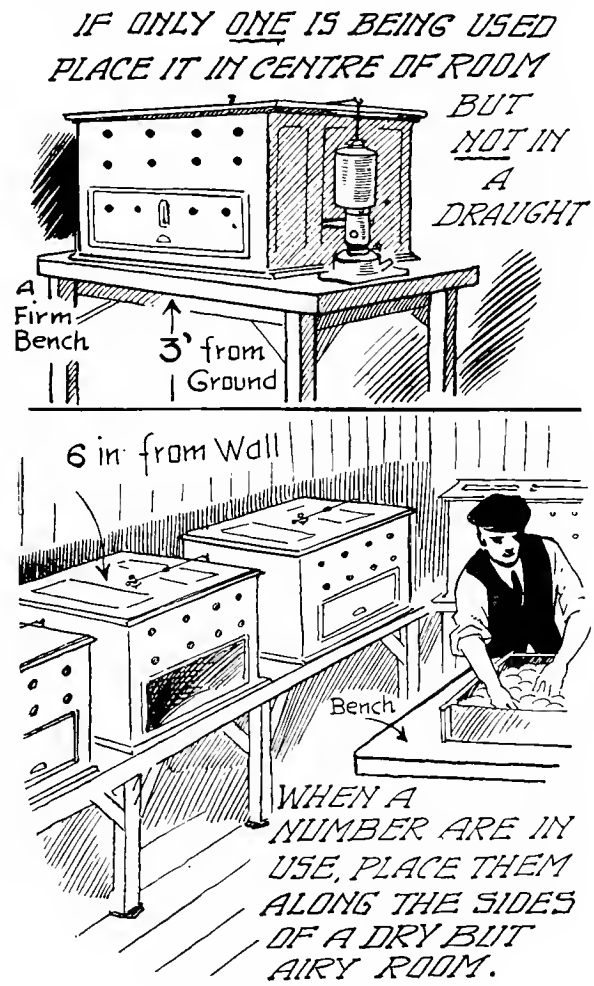


FIG. 90. FIXING THE INCUBATOR

double walls. Fortunately, among our outbuildings there are two excellent ground-floor rooms in a granary, while indoors we have a dairy; and in neither case do the doors open directly into the outside air. This is a point which wants attention, especially during winter hatching; so, if a small entrance room cannot be arranged, then heavy curtains should be hung inside to minimize any detrimental effect caused by an inrush of air when the incubator room has to be visited.

It is important to keep the room temperature

steady. At one time I scarcely troubled about this matter as long as the air was neither chilly nor unduly hot, as I depended entirely on keeping the required heat in the egg chamber of the incubator. But I am convinced that a room temperature of 60° to 65° F. maintained throughout the hatch, combined with fresh air, is conducive to the best results.

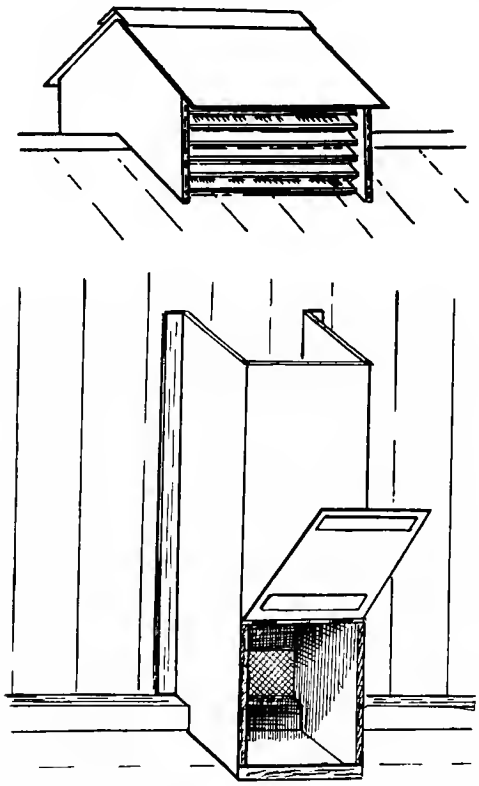


FIG. 91. VENTILATORS FOR AN INCUBATOR SHED
A roof ventilator or Louvre box, and an inlet shaft, the latter showing the hole covered with wire-netting. A trap-door could be fitted to the bottom of the shaft (as shown) for use during hot weather, when the shed requires extra airing

The Incubator House

If I had to build a house specially for the purpose I should make it of 1 in. match-boarding on 3 in. by 1½ in. framing, line it with felt, and fit an inner wall of three-ply. The floor would be of concrete or earth, 6 in. or more above the level of the surrounding ground, and the roof apex-shaped, 8 ft. high to the eaves and about 10 ft. to the ridge, and located where it would not be too much exposed to the sun. The doors would be porched, and both of them made to slide instead of being hinged, so the actual incubator room would be entered through a small lamp room. The windows, at each side, would be 4 ft. to 5 ft. up, hinged at the bottom and to open inwards. If the house had to be of any considerable length, there would also be a window or two in front, otherwise one at each side should be ample to provide sufficient light for the interior.

Ventilation would be similar to the old Tobin system, because in my experience it is one of the most suitable ways of ensuring an abundant supply of fresh air without draught in almost any building in which incubators—and artificial brooders—are installed. This consists of inlet shafts along the front reaching two-thirds or more up the walls inside, with a roof ventilator as the outlet. The actual inlets are oblong holes (4 in. long by 2 in. high), cut through the front of the house about 1 ft. from the ground, while the shafts are narrow three-piece troughs (6 ft. or so long with 3-in. wide sides and a 6-in. wide front), the opening being butted vertically against the inside wall of the house and, of course, secured. Two of these shafts will provide safe inlet for over 3000 cub. ft. of fresh air per hour. The air is discharged above the level of the incubator so that no draught is perceptible; and the cool incoming air, by its greater density, forces the warm air through the exit in the roof. Diffusion to a very small extent will take place, but not sufficient to create any undue draught.

Where rats or other vermin are feared—particularly in the case of such a building being used for chickens—the holes should be wired over with ½ in. mesh netting or covered on the outside by perforated zinc. A lid could be fitted to the top of the shaft, to regulate the influx during gales; but this is seldom necessary, unless the building is in a very exposed position. The outlet (one will probably be ample) should be placed at the highest part of the roof, and as far as possible from the inlets. Perhaps the best arrangement for carrying off the vitiated air is a square shaft capped by Louvre boards, or a Louvre box as it is called. There are, of course, other ways of ensuring fresh air without draught; but the system I have described, old as it is, will do admirably for the purpose. I have omitted dimensions of floor space, simply because the size will depend upon the number of incubators to be housed. The best air in a room is said to be that which circulates about half-way between floor and ceiling; but for all practical purposes, if the incubators are placed 3 ft. from the floor it will suffice. When several machines are being accommodated they should be arranged around the sides of the room, leaving a margin of at least 6 in. from the walls, and enough space between the incubators to enable the attendant to see to the lamps without difficulty. They must not be set against the walls or in stuffy corners.

Avoid Vibration

When the floor is of wood I find it advisable to place the incubator on a solid bench, and if there is

any fear of vibration to put a rubber pad under each corner or foot of the machine. Vibration, shock or jarring of the artificial hatcher must be avoided. There should not be any banging of doors or stamping about the room. The passing of a traction engine or any heavy vehicle will often shake a building, causing it to vibrate and consequently jarring anything inside. Such disturbances would be disastrous to eggs which were undergoing incubation.

Some years ago a correspondent who operated a hot-water machine in a spare ground-floor room of his dwelling house which was situated in the south-east district of London—where, to use his own words, "it was subjected to the banging of doors and windows, children running about, and the usual heavy street traffic and noises"—overcame the difficulty by a very simple device. He obtained two boxes wide enough to stand the legs in, two legs in each, and filled them with sifted mould made wet so as to be dead weights. A table was then fixed into the boxes and the incubator was placed on it, with a piece of 3 in. by 1 in. indiarubber under each foot of the machine. It was left for twenty-four hours to sink into the mould by its own dead weight, care being taken to see that the table was well sunk and level. After this was arranged, "there were no shaken germs or crippled chicks, and good results were obtained."

It is essential to have an equal temperature over the whole egg chamber; hence the machine must be set dead level. The spirit level should be used once or twice during the time the incubator is being tested out. It is beneficial also to have in the room a bench or some contrivance on which the tray or drawer can be placed while the eggs are being tested or turned. There must be plenty of room to permit of free movement of the attendant. Nothing is gained but much may be lost by attempting economy in this direction. I mention the matter because too often the tendency is to overcrowd the incubator room. Not only is there then the risk of breaking the eggs when handling the trays, but the atmosphere is apt to get so foul that the ventilation necessary to clear it means causing a severe draught; and this as well as the foul air is detrimental to the developing embryos. Pure air is essential for growth.

Preparing the Incubator

I have said that it is almost impossible to exaggerate the importance of starting with a good incubator. Manufacturers of such machines will guarantee them to give satisfactory results under normal conditions; and no reliable maker will withhold such a guarantee. When fixing the incubator, do so according to the directions sent with it; and before putting an egg into the chamber carefully read the instructions.

When it is being prepared for the first hatch and the required temperature is reached, let it run (empty) for a few days, so that there shall be plenty of time for any readjustments to be made. Before putting an egg in, be quite sure that it is working perfectly, and that the required degree of heat can be maintained without difficulty. It may be as well to mention that fluctuations in temperature are much more likely to occur when the machine is running empty, because the eggs always have a steadying influence. If the incubator is a second-hand one, thoroughly wash out the egg chamber—the tray and the canvas, the drawer and the entire space into which it fits—with hot water and carbolic soap; after which spray it with a guaranteed germ killer, and subsequently dry it. Some authorities suggest, in the case of an entirely new machine—one which has not been in operation—that it be run for at least two weeks prior to commencing incubation, so as to ensure its being thoroughly dry. But if it is a good one, and the worker is not new to incubation, a week will probably be quite long enough to enable him to understand it and get it regulated to run consistently at the desired temperature.

Make certain that all the parts work freely and that the drawer, door, or tray does not stick. If they cannot be easily moved try glass-paper, or apply a touch of black lead; but be very careful to see that, when shut, the door is airtight. Take particular notice that the damper over the lamp flue is so balanced that it lifts off level all round and does not tilt; when it is set to work properly it should be raised so as just to touch the lamp flue and not to rest heavily on it. See that the suspender rod (connecting the damper with the horizontal lever or arm) is tight in the hole so that the damper hangs level. Some readers may think that this is a trivial matter; and yet if it tilts at all it throws additional weight on the capsule or thermostat and will interfere considerably with the temperature of the egg chamber. It must be the endeavour to regulate the heat supply so that as little work as possible is thrown upon the regulator. The purpose of a regulator is primarily to compensate for fluctuations of atmosphere; and all rough adjustments should be made by regulating the size of the lamp flame.

Prior to placing the eggs in the incubator mark a cross on one side and a circle on the other. Commence by putting the eggs in the centre of the drawer or tray in rows and fill in all round to prevent the eggs rolling; completely fill the space so that when it is necessary to move the drawer or tray the eggs will not get jarred or cracked. Do not put any eggs in until the temperature of the egg chamber is steady at the required degree. And when the eggs are first placed in it, leave

the drawer, or the door of the egg chamber, slightly open for an hour or so to enable them to warm gently, because to plunge eggs suddenly into a high temperature may result in most of the yolks bursting and thus spoiling the hatch.

The Necessary Temperature

The temperature required for successful hatching —the temperature of the live egg—is between 102° and 106° F.; but the best heat at which to work the incubator for hen eggs is as near as possible around 104° F. The natural heat of a hen's body, in health, is about 98° F. (blood heat); but when the broody instinct is upon her, when in fact she is thoroughly broody and sitting on eggs, the natural heat is increased. It was common in the old days to refer to the broody "fever" and to say that clucking hens were in a feverish condition. A well-known American incubator expert once put it on record that during some of his earliest experiments he found that the body heat of four hens which he tested with a clinical thermometer gave readings of 98°, 102°, 103°, and 105° F., and that those with 102° and 103° F. were the best hatchers.

When a hen becomes broody the normal warmth of her body is increased by the condition of the blood-vessels in that part of her body coming into contact with the eggs. These become distended, and the accelerated blood-flow causes the temperature of the atmosphere around the eggs to rise. The actual blood heat of the broody hen, however, should not be higher than that of the laying hen, and when it is then it is due solely to the state of the hen's bowels—constipation will "send up the temperature." It must be admitted that the physiology of broodiness in hens is not yet fully understood; but in my opinion it is a mistake to say that when a hen first becomes broody her temperature is higher than when she is normal.

The heat supply of the artificial incubator, however, should not be allowed such a wide margin as between 98° and 106° F., and on no account should it fall below 100° F. I find it best to work around 104° F., which will allow of a slight variation either way without much danger of untoward results following. If by the end of the first twenty-four hours of incubation the temperature of the egg chamber has not reached 103° F. there is no cause for anxiety provided that, during the week's test, the regulator has been

FIG. 92. THE INCUBATOR ROOM OF A POULTRY FARM
The building contains twelve machines with a capacity of 4000 eggs

set to register such a degree. A gentle rise is preferable to a sudden one, and the eggs absorb a large quantity of heat at first.

When incubation is in progress, and particularly during the early stages of the hatch, fluctuations should be avoided; any "jumpiness" is very apt to cause all but the strongest germs to perish. It may be as well to mention that the normal embryo, the live germ within the egg, will stand a prolonged lowering of temperature much better than an increase, since the former will merely tend to delay the time of hatching, whereas a very high temperature, such as 106° F. for instance, if continued for any considerable length of time, will prove fatal. This is especially so during the earlier stages of incubation; hence it is preferable to adjust the temperature rather low than high at first, gradually raising it to the required degree. It is generally advisable, therefore, to fix it at 103° F. for the first ten days and get it up to 104° F. at the twelfth day, continuing with this latter temperature for the remainder of the hatch.

Overheating the eggs is much worse than underheating them, and yet it is more apt to occur, simply because adjustments are likely to be overlooked by the novice when the embryo, at about the fourteenth day of incubation, is appreciably generating animal heat in the shell. During the last week, in fact, it is not disastrous if there is a slight drop; but the aim should be to maintain a steady temperature. Hence, get the adjustment of the regulator correct before putting the eggs into the machine.

FIG. 93. TESTING THE EGGS

The Period of Incubation

It may here be stated that, although the period of incubation for fowls' eggs is twenty-one days, chicks will hatch from strongly fertilized eggs on the twentieth day—if the eggs are strictly new-laid when put into the machine—whereas chicks from stored eggs may not be hatched until the twenty-second day, or even later. For duck, goose, and turkey eggs, the average is twenty-eight days, some hatching on the twenty-sixth and others on the thirtieth.

The incubator should be started with a full drawer rather than with one in which there are gaps, because these latter will be sure to occur on the seventh or tenth day, when the eggs are tested, as I mentioned while dealing with the broody hen. Should many eggs have to be taken out as useless at testing time —and on no account should infertile, addled or "dead" eggs be left in the incubator—others could be put in; but, prior to doing so, they must be warmed for twelve hours or more in the drying box, because to place cold eggs into an incubator with those which have been there for a week or more would chill any with which they came into contact. However, in no circumstances should I add eggs to the incubator when once it has been started, if for no other reason than that it would cause trouble when the first chicks were due, while, even if successful, it would necessitate the rearing of small broods. I mention the matter because it has been advocated by some writers; but I certainly do not practise it. If the quantity of infertile or faulty eggs is very considerable at the first test, much better continue with those that remain, or put them under broody hens and start the incubator afresh. In the former case, though, the eggs must be kept to the centre of the drawer by means of cardboard partitions, so as to obviate any chance of their rolling about and getting jarred when it is removed for the purpose of turning them.

Regulating the Heat

The lamp and lamp flue create and convey the heat, hence here must be the regulation or control. The flue has two outlets, one being directly above the

flame, topped with a damper and allowing the heat to escape into the room when necessary, and the other, about half-way up at right angles, to convey the heat to the tank; but the flow of heat is regulated by a capsule which rests in a bracket suspended about an inch above the eggs in the incubator. In both kinds of machine, certainly in the hot-water type, the capsule is the vital part, the very heart of the machine, as it controls the lifting rod and regulating arm, which in turn control the damper over the lamp flue. It is on the setting of the whole regulator that so much depends, and it is not so simple as some authorities

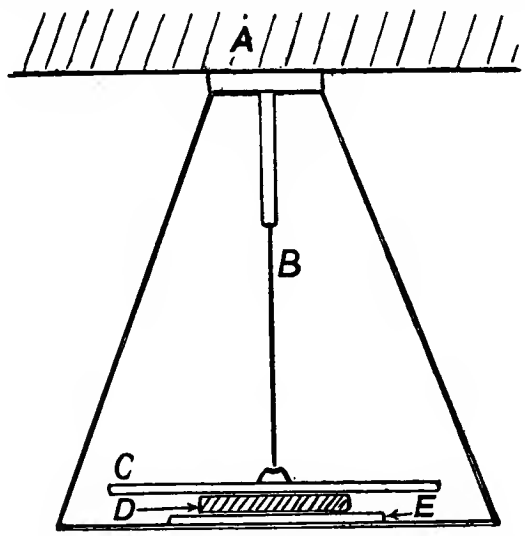


FIG. 94. CAPSULE STIRRUP IN EGG CHAMBER OF INCUBATOR

The capsule (*C*) is shown resting on a soft pad (*D*) above the washer plate or capsule table (*E*). *A* represents the bottom of the water tank, and (*B*) the regulating or lifting needle which is resting on the button of the capsule

would lead the novice to believe. He must very carefully consider the whole arrangement. This consists of a capsule which rests on a bracket or stirrup which in turn is connected, by a brass tube, with an outlet on top of the incubator. Through this tube is a rod or needle, one end of which rests on the capsule and the other is under the milled-head regulator screw almost at the end of the regulator arm. This arm is hinged to the incubator at one end, while at the other it holds the damper over the lamp flue; and upon it there is a movable lead weight. The farther the lead weight is moved along the arm from the needle end the more pressure is brought to bear upon the capsule.

When the damper covers the outlet into the room all the hot air from the lamp passes along the tank flue; hence by moving the damper the supply to the heat chamber is regulated. The damper controls the course of the heat, but the damper itself is controlled from the interior of the egg chamber by the capsule, which expands or contracts according to the temperature of that chamber, in the former case raising the damper and allowing any surplus heat to escape, and in the latter lowering the damper and letting more heat into the tank. The capsule is constructed of two very thin copper or brass plates or discs, the bottom for preference not as thin as the top, with a quantity of liquid hermetically sealed between them. It must contain liquid that will boil above blood heat (98° F.), such as a mixture of sulphuric ether (two parts) and methylated spirit (one part).

When the incubator is fitted up, the regulator arm or lever must be balanced so that, while the temperature in the egg drawer does not exceed 104° F., the damper will just clear the lamp flue and ensure that all the heat passes into the tank. If at any time the temperature of the egg chamber should rise too high, then the boiling of the spirit, which has no outlet in the capsule, causes the sides to expand. This raises the perpendicular rod or needle so that it forces the regulator screw up, and slightly tilts the arm or balanced lever, which lifts the damper from the lamp flue and allows some of the heat to escape into the room. When the temperature of the egg drawer cools again the capsule deflates and the damper is automatically lowered once more into its position, resting lightly on the lamp flue.

Testing the Capsule

It can be imagined that the incubator must be set dead level to ensure absolute accuracy of the regulating apparatus. But there are other minor though equally important details. It is essential that the capsule is in working order. To test it, therefore, dip it into very hot water or hold a lighted match under it but not too close; if the capsule immediately expands it is good enough for service. Then, too, the damper over the lamp flue must lift off level all round and not be tilted to one side. Again, there must be accurate working of the capsule. In no machine does it lie on the metal stirrup itself, simply because the heat of the metal would cause it to expand before the required temperature was attained. Between it and the plate or capsule table there is a washer; but as a rule this is made of leather or asbestos, which is too hard to enable its being delicately adjusted. Something has to yield when the capsule expands and force is put on the perpendicular rod or needle by the milled-head screw; and it usually is the capsule. If, therefore, it rests on a hard surface it has a tendency to kink or bend, in which case it does not register in a correct manner. A soft bed, however, such as a felt corn pad about $\frac{1}{4}$ in. thick and with the adhesive part attached to the stirrup, in lieu of the hard washer, will enable the capsule to ride when fixed, the pad

absorbing the force, and the capsule remaining absolutely normal. When so fitted the incubator can be worked for two or three months without any appreciable variation.

The regulating apparatus must be sensitively adjusted. Some hot-water incubators are fitted with a metal thermostat instead of a capsule. This kind of regulator consists of thin strips of different metals; and although not so sensitive or so powerful as the spirit capsule, it is not affected by changes in the barometric pressure. The operator has to regulate the heat supply in such a way that as little work as possible is thrown upon the regulator.

Importance of the Lamp

The management of the oil lamps must not be overlooked, because it has an important bearing on the subject. The lamp must produce a clear bold light, without smoke, smell, or spike; hence a good burner into which the wick fits exactly, the best paraffin oil, and a special wick are required. Any dirt or foreign matter is always attracted to the wick, which may thus get choked, making it difficult to manipulate, and preventing a good flow to the burner. The reservoir should be large enough to hold sufficient oil to burn steadily for at least thirty hours; but in this case the lamp must be seen to once *per diem*. It may here be noted, that for a 250-egg incubator in a room temperature of 50° F., the oil consumption will be from five to six gallons for the hatch. Probably two gallons will be used in the first week; but during the last week the consumption drops pretty considerably. This refers to incubators in the early months. As the weather becomes warmer and the room temperature naturally higher, the consumption of oil is less. It is by no means a bad plan to have duplicate lamps for each incubator, so that each can be cleaned and prepared at a convenient time; on no account should the eggs be touched with oily hands.

The lamp should not be completely filled, i.e. filled to the brim; while within ten minutes after relighting, have a look at it and make any necessary adjustments to the flame. Certainly, a full lamp gives more heat than one half empty; but the most economical heat for an incubator is from a moderate rather than a very high flame. When lamps are not in use the wicks should be turned right down, otherwise much oil will be wasted, and there is also the danger of the lamp flaring when it is lit. The flame must be clear and without smoke; camphor will do much to prevent smoking, and a piece as big as a walnut is enough for a gallon of oil.

The Thermometer

It is of the highest importance that perfect accuracy of temperature be secured and maintained; hence the necessity for getting a reliable thermometer. If there is any doubt about its accuracy do not hesitate to have it tested by a chemist; it is worth the few pence charged. It should be specially made for incubator work, with the scale engraved indelibly on the stem. If it has to hang across the egg tray, suspended immediately above the eggs—as in hot-water incubators with glazed doors—see that the bulb is quite free of the metal frame, while if it has to be put through the front of the drawer it must be firm and dead level. In this case when the straight or tank thermometer is being used, the bulb is

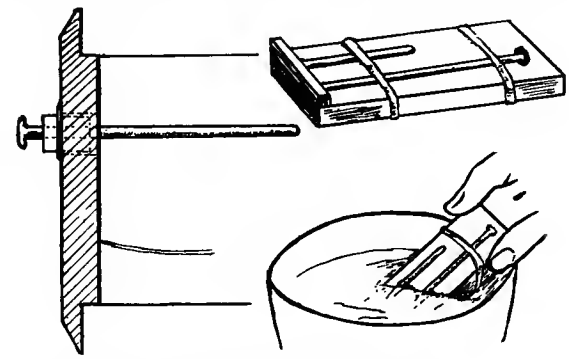


FIG. 95. THERMOMETERS

On the left, a section of the incubator drawer with the thermometer fixed through a cork. On the right, a simple way of testing a thermometer with a clinical thermometer, by attaching both to a piece of wood with elastic bands and immersing in hot water

cylindrical, and it should be steadied by means of a small cork bored centrally.

The best thermometer will be rendered practically useless if care be not taken that it is fixed on a correct level in the incubator; and a little time spent in manipulating it to a nicety will be well repaid by results. The thermometer should be placed with its bulb level with the top of the eggs to register the heat, as an inch or two above the eggs, and nearer the tank, is always several degrees higher than the heat required for incubation. The bulb of the thermometer should rest about $1\frac{1}{2}$ in. above the bottom of the egg tray; and, if touching an egg, it should be a fertile one. A very common mistake is in taking the temperature for the egg chamber from dead eggs, or from the egg chamber instead of the eggs. There is a difference of from one to three degrees in the reading between a live egg and a dead one, according to the stage of incubation of the live one; but since it is not possible for the novice to have the bulb always on a live egg, let the thermometer be placed immediately above the eggs. Fixing it too high means that, while it may register 104° F., the eggs themselves have actually been as low as 101° F. If the temperature is taken from fertile eggs—which is the proper method—the heat of them should be 103° F. at the

start and never exceed 105° F., 106° F. being the extreme limit of safety. Eggs which have been heated to 110° F. at some time during their latter stages of incubation may perhaps hatch out, but the chicks from them are rarely worth the trouble of rearing.

Airing and Turning the Eggs

In natural incubation the broody hen sits tightly on her nest for the first two or three days, but after that time she airs the eggs once *per diem*, simply because she must leave the nest in search of food. When utilizing hens for hatching we follow Nature to such an extent to see that they are taken off the eggs daily to feed and to stretch their legs. Some poultry-keepers of my acquaintance, when adopting artificial methods, air the eggs daily from the time they are first put in the machine; and yet it is absolutely unnecessary to disturb them until the expiration of the third day. Egg contents during incubation evolve certain gases which are detrimental to the embryo; but these gases do not come into being to any extent until the third day of incubation, when the circulation of the blood is established. Hence, it is obvious that the eggs do not require airing before that time; and when it is practised it is very apt to result in dead-in-shell. In the process of incubation the blood becomes charged with carbonic acid by its interchanges with the fluid present in the tissue. Unless this carbonic acid gas is removed, the embryo in the egg will perish; therefore oxygen must be used to dispel the harmful gas, and thus allow the embryo to live.

The most popular method of using oxygen is to allow the access of fresh unvitiated atmosphere; and this, of course, is done when either a sitting hen is removed from the nest or the eggs are taken from the incubation chamber of the artificial appliance. A chick embryo is physically incapable of directly exercising its respiratory organs until the fourteenth day of development; but the blood, established eleven days (approximately) before the lungs are able to take a directly active part in respiration, is the oxygen carrier. The act of airing, therefore, is to enable the eggs undergoing incubation to absorb or inhale the atmosphere outside the incubator in order to revitalize and strengthen the embryo, and also to allow the escape of the products formed by the germination processes.

It can be imagined that if a machine is properly ventilated there will not be as much carbonic acid gas present as when a few perfunctory holes are made in the walls of it in the hope that they will serve as efficient ventilators. Ventilation is a most important subject: the ingress of atmosphere must carry a current sufficient to displace the undesirable vapours in the chamber, but there must be a uniform temperature and an almost pure atmosphere. There are machines possessing apertures which do not ventilate, but create draughts, and during working hours require plugging with some suitable medium. To a large extent, however, success depends upon the surroundings of the incubator; and this is why the incubator should be worked in a room where it will not be subjected to draughts or to sudden and severe changes of temperature, and where the atmosphere is almost pure, that is, as good as in a living room, pleasantly habitable to an ordinary human being—but not to a fresh air faddist.

Time of Exposure

In the airing of the eggs there can be no hard-and-fast rule as to the time it should occupy, that is, the time that the tray or drawer should be out from the incubator. Much airing in a cold atmosphere is very injurious, while very little in hot weather is likewise harmful. When the air is cold outside the machine the pressure is very great, and the embryos would receive an abundant supply of oxygen at all times without airing; but if it is very hot outside, the pressure is very light, and the air moves very slowly through the machine, so that in this case the airing is beneficial. Ventilation of the drawer or egg chamber has to be taken into consideration in the airing of the eggs, and this, in turn, is connected with the moisture question. However, at the moment I am dealing with airing the eggs outside the incubator.

Under natural conditions they get aired once daily when the hen leaves her nest for food; and she may be away for half an hour or so. But since that generally takes place during warm weather, it can be imagined that it is a vastly different matter when incubating artificially in winter and early spring. As I say, no hard-and-fast rule can be made as to the exact time that should be allowed. Nevertheless, granted ideal conditions in the hatching room with a temperature of 50° to 60° F., it will generally be found that, in the early part of the season, five minutes daily, including the time taken in turning the eggs, will be sufficient for the fourth to seventh days—the remainder of the first week of incubation—and during the second week, after which an extra minute *per diem* may be allowed up to the nineteenth day. With a room temperature of much less than 50° F. airing should be permitted only during the last few days, while if much above 60° F. ten minutes daily from the fourth day, and fifteen to twenty minutes during the last week, will probably be needed. But in any case the temperature of the eggs when returned to the drawer should be got up within an hour; so avoid

too much airing. A daily exposure is necessary, but out of a draught.

Many experienced operators tell when the eggs have had sufficient airing by adopting the ancient Egyptian method of holding them up to the eyelid—used in those days to ascertain the actual temperature of the egg during incubation—until they feel neither hot nor cold, when they are deemed to be ready to return to the machine. This method of regulating the airing period is preferred to allowing a set time according to the stage of incubation, which certainly takes no account of the temperature of the incubator room, which may vary from day to day. One point to note is that as soon as the eggs are removed from the machine, it is advisable to shut the door, or to close the open part of the egg chamber with a piece of thick felt. It must be remembered that the hen is warmed up ready to bring the eggs to the required temperature immediately she returns to the nest.

In addition to airing the eggs they must be gently moved daily, although not before the expiration of the third day of incubation. The hen naturally moves some of her eggs when returning to the nest, since she has to make room for her legs, while, before settling down to steady sitting, she shuffles them about with her beak to ensure that all of them are covered by her breast feathers. She certainly moves them, hence we must do so in artificial incubation. In whatever position the egg may be lying, the germ always floats to the top, at which point it receives the greatest amount of heat. The lower part of the egg is never as warm as the upper surface, whether in the nest or the artificial incubator, although the difference is probably not so great with eggs under a broody hen as with those being artificially hatched. If they were not shuffled but just allowed to remain unmoved, the white which covers the upper part of the yolk would gradually fall to the under side; and then the embryo would become attached to the upper side of the shell. It would get "stuck," to use a word familiar to those who operate incubators, thereby hindering or entirely arresting development.

Why Eggs are Turned

Turning the egg enables the germ to occupy a different portion of the shell from that which it previously occupied. The shuffling also tends to compensate for any slight inequalities which may exist in different parts of the machine, by ensuring that each egg shall in turn occupy each and every part of the egg chamber. If they were turned completely over immediately they were taken out, the embryos would come into sudden contact with the cold part of the egg and, therefore, be apt to perish; this is particularly so during the early stages of development. Hence, it is always advisable to allow them to air for a minute or so before they are turned.

If an automatic egg turning device is not fitted, and the eggs are in regular rows, they can be readily shuffled by running a damp finger over the rows from end to end once or twice. There is no need to turn them completely over; but in most machines it is beneficial to change their position in the drawer or tray once a week, those at the sides being moved to the middle. With regard to the number of times they should be turned during the day, this must be left to the operator, because it generally depends upon the make of incubator. Some workers suggest a twice-daily turning, while others advocate thrice a day. I find it answers to disturb them only once regularly during the twenty-four hours.

An American investigator is said to have set a hen on a nest in a coop with a glass bottom, and in an elevated position, so that he could observe her every movement, and as a result he stated that in one day (twenty-four hours) she turned those eggs no fewer than twenty-six times. Possibly that was so; but the ordinary poultry-keeper does not set a hen on a nest with a glass bottom, while such a nest would undoubtedly unsettle the hen to such an extent that she could not possibly keep still. In view of this experiment, however, it has been suggested that it is fairly safe to assume that in an ordinary nest the hen would turn or shuffle the eggs at least twelve times in twenty-four hours. Even that might be so if the nest were badly made, and if the hen were troubled with parasites. The same authority stated that in the natural method turning would be continuous throughout the twenty-four hours, while in artificial incubation it would be limited to a period of about fourteen hours, and that the eggs should be turned twelve times during that period.

Such frequent turning may be necessary with some modern cabinet incubators; but in the type I have suggested for the novice, once *per diem* will be ample. The normal steady hen disturbs her eggs only when she is settling down after returning to her nest. Eggs should not be aired after the eighteenth day by having the drawer or tray entirely removed from the incubator; but it is advisable to attend to them on the nineteenth day. This is necessary so that any which are starring or chipping on the under side of the shell, with the beak just at the point of rest on the bottom of the drawer or tray, may be turned upwards—the "star" should be on top. To do this the drawer must be only partially opened, pulled out sufficiently to enable the eggs to be seen; and they must be turned as rapidly as possible to the desired positions. If the weather is at all cold this turning-up process should be done not more than twice daily, and on

the nineteenth and twentieth days; if hot it may safely be done as often as thought desirable, but always quickly, because the eggs must never be allowed to cool down after they have starred.

Moisture and Ventilation

I have already mentioned in this chapter how moisture is provided and how it can be applied. As a rule new-laid eggs do not require moisture before the end of the second week of incubation, although if the ventilation of the room and the regulation of the machine be perfect, hen eggs should really need no added moisture at any time. It is possible under such conditions to hatch without moisture, although much depends on the weather. In this direction it may be noted that barometrical changes are a much more important factor in success or failure than is generally imagined; and it is because of this that the same incubator will not always give the same results. It certainly stands to reason that, with a low barometer, when the atmosphere is charged with superabundant moisture, there is no danger of the supply inside the machine being insufficient; and any extra would be deleterious to the embryo. On the other hand, when the barometer ranges high, it might be necessary to have an artificial supply towards the end of the period. If sufficient moisture be not available the process of evaporation goes on within the shell to too great an extent, whereas an excess of it retards evaporation of the fluid in the egg, and as a result the "chick" is actually drowned.

A matter which has some bearing on the moisture question is the variation in the temperature of the atmosphere of the room itself; a variation of a few degrees will make a difference in the amount of air passing through the same sized openings. In a small room the continuous burning of a lamp has an influence on the moisture in the atmosphere; the parched condition of the air can be at once detected. This must be avoided as much as possible by a thorough system of ventilation at all times; but if it cannot be allowed then there should be added moisture in the egg chamber. However, in different machines and in varying circumstances different amounts of moisture are required. It is most difficult for me to lay down hard-and-fast rules which are applicable to all cases. Hence it is in this matter particularly that the instructions sent with the incubator should be studied, while the purchaser should not hesitate to consult the maker if any difficulty arise during the period it is being tried out.

I have remarked that no hen egg should really require added moisture at any time during incubation. I must, though, qualify that statement because I recall that some eggs cannot be hatched without moisture—those in which the shells are dense and thick. My attention was first drawn to this matter in the case of Barnevelder fowl eggs; and it has subsequently been proved to be so with Welsummer eggs. A correspondent wrote to me that he could not succeed with such eggs in an artificial incubator, owing to their shells and skins being so hard and tough, although he had obtained good results when employing broody hens.

On my applying to a well-known specialist of these breeds, however, I ascertained that when the eggs are first put into the incubator they should be splashed (as in contrast to sprinkled) with water at about 75° F. and the water tray should be completely filled from the beginning. This process has to be repeated after airing for fifteen to twenty minutes, on the eighth, fifteenth, and nineteenth days, after which the egg chamber should not be opened again until the hatch is completed. He assured me that it is most important not to have the water warmer than 80° F., since in such an event it would considerably extend the time of the drawer temperature returning to the correct degree. I was given to understand, also, that the extra amount of moisture is necessary for these particular kinds of eggs in hot-water and hot-air machines alike, and that both types of incubator, in these circumstances, must be operated at 105° F. throughout the whole period.

I have not attempted to hatch Barnevelder or Welsummer eggs by artificial means, although I have succeeded with them under broody hens without any special attention beyond that paid to such birds in the usual way. Readers should note that this application of extra moisture and the high temperature are required for these two breeds only, and such treatment is not recommended for eggs of other breeds, unless the shells are exceptionally dense and thick. It is certainly not necessary when artificially incubating eggs of the popular breeds of fowl.

The Air Space in the Egg

However, to return to the moisture question generally; careful watch should be kept on the air space of the egg itself during the process of incubation, because once the differences in the air space are understood, it is a reliable guide as to whether the eggs are receiving too much or too little moisture, that is, whether evaporation is excessive or insufficient. The air space may be said to be the unfilled part of the egg which is almost invariably situated at the broad dome or "blunt end" of it, and can be easily observed by the use of an electric torch for testing. To begin with, the space should be the same as that in a day-old egg, roughly about the size of a threepenny piece. Then, because the egg should gradually lose some of

its moisture content during incubation, the air space steadily increases in size until the nineteenth day, when it occupies almost one-third of the egg.

The best way to ascertain the progress of the air space is to examine eggs which are being naturally incubated, and to take note of it at intervals, say on the first, seventh, thirteenth, and nineteenth days; but never after the nineteenth day, and not then, if starring has commenced. Different eggs vary slightly in the same hatch; but if the average is taken it will assist the novice very considerably in determining whether evaporation is proceeding normally or not. Few beginners at poultry breeding would attempt artificial incubation before they have had a season at hen-hatching, if simply because natural methods are undoubtedly much easier. Hence during hen-hatching there should be ample opportunity for observing the increasing size of the air space.

In this direction the novice will find it helpful to prepare a diagram. By means of Indian ink or waterproof drawing ink, the outline of a normal-shaped 2-oz. egg should be sketched on a piece of Bristol-board. The egg will be about $2\frac{1}{8}$ in. diameter from pole to pole. With blacklead pencil, mark lines across it from the broad end, the first line being $\frac{1}{16}$ in. away, the others (three) $\frac{5}{16}$ in., $\frac{1}{2}$ in., and $\frac{11}{16}$ in., respectively, all measurements being taken from the broad end of the egg outline. They represent, roughly, the air space in the egg at the periods of incubation mentioned; but the lines must be adjusted to the progress noted in the manner suggested above—after observations of eggs which are undergoing natural incubation. If on examination the air space is found to have increased too rapidly, and it is much larger than the size indicated on the diagram, more moisture or less ventilation of the egg chamber is required, whereas if the air space remains too small more ventilation and less moisture should improve matters. As a rule, however, most incubators are inclined to dry out the eggs too quickly rather than too slowly, although ventilation has much to do with it.

A second method of ascertaining the percentage of moisture is to weigh the egg. The normal loss of weight in the first six days of hatching is 10 per cent; if the loss be under that then the eggs are getting an excess of moisture, and if over, not enough. When more moisture is required boiling water can be put into the moisture tray under the incubator; or the egg chamber can be sprayed with hot water while the eggs are being aired outside the machine.

Another way of supplying moisture—sometimes adopted during very dry weather, but only for the last three or four mornings before the chicks are due to star—is by means of a flannel. Into water, at a temperature of about 120° F., place a piece of house flannel, the size of the egg tray or drawer; and after a moment or two wring it out by hand and put it on the eggs when they have been turned. Let it remain there for five minutes; then remove it and replace the drawer in the incubator. When the loss of moisture is under 10 per cent the ventilation should be increased so that there can be more drying out. All these matters, however, are supposed to be explained in the instructions sent out with every standard incubator; but they are sometimes so brief that one requires to be an expert to understand them.

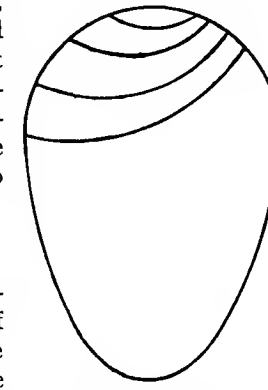


FIG. 96
DIAGRAM OF AN EGG, SHOWING AIR SPACES DURING INCUBATION

At Hatching-out Time

Although, as I have remarked when treating of natural incubation, a reliable broody hen may safely be left to herself to do the actual hatching, this is not always the case when artificial means are being employed. A good machine which has been properly operated can be depended on to hatch a high percentage of hatchable eggs; but as it does not possess brains, the man in charge must use his to the best advantage until the hatch is completed. Very many novices fail to get the best possible results owing to over-anxiety. They are for ever fussing over the machine by continually opening the drawer to see how many chicks are hatched or to help some struggler to get rid of its shell. The drawer should be kept closed during the whole time, even though the chicks which are first hatched may get in the way of those which are trying to leave their shells. But there is plenty of room for all; and I have never yet had as many eggs in the incubator on the nineteenth day as were put into it at first, because, unfortunately, some are proved useless at testing time. There is always, therefore, a little or much extra space according to the result of the test. Admittedly, live chicks have a habit of crowding, even when they are just hatched, and by doing so they may interfere with those which are working their way out; but let them do so.

To obviate this, some hot-air incubators are fitted with an egg tray having a false panel, which can be taken out on the nineteenth day. This part of the tray is placed near the door (glass-panelled), so that as the chicks are hatched they make towards the light, and fall on the canvas-floored nursery tray underneath. This drop, nevertheless, has been known to result in

what poultrymen call "sprawls"—slight injury to the chicks' legs—hence, I do not remove the false panel, should I be operating an incubator fitted with it. Even if the drawer is only partially opened and for a few seconds, and not more often than is absolutely necessary to remove a few chicks, it may prove disastrous. Each time the egg chamber is opened there is a lowering of the temperature owing to the inrush of cool air. This has a tendency to dry and toughen the inner membrane of the shell on the chick which has just starred or is about to do so, with the result that it is unable to proceed; and it may also chill chicks which are still wet. There must be no airing of the eggs; hence do not open the drawer.

Some hot-water machines are, or were, fitted with a drying box, to which it was the custom to transfer the chicks to let them fluff out and dry; but even that I should not use. It would be much more satisfactory to put the chicks direct from the drawer into the artificial rearer, but not before they are thoroughly dry, the rearer being heated up on the eighteenth day of incubation; but many workers wait until the hatch is over, then remove the drawer and put the chicks in the nursery. It is better to wait until quite a lot of the shells are starred—or, as some operators term it, "pipped" or "chipped"—before opening the machine and working rapidly to turn all the stars up, as already indicated; and these eggs should be placed as near the front as possible. The chicks must not be removed until they are thoroughly dry, because on no account should chicks be taken from the incubator until they are fluffed out. I have always maintained that the moisture arising from the wet chicks—a normally hatched chick is moist when it leaves the shell—does much to assist the general hatching. Hence the necessity for great care being exercised at the actual hatching-out time to prevent any undue airing or drying of the eggs by frequently opening the drawer. More moisture is needed at that time than at any other period of incubation; consequently if it is thought advisable to apply moisture, it should be done towards the end rather than at the beginning of incubation. However, too much moisture will tend to smother the chicks. A warm fresh air is preferable to a very hot atmosphere when the actual hatching-out is in progress; hence the importance of keeping the room properly ventilated. In no case, though, must the eggs be cooled down when once starring has commenced.

Causes of "Dead-in-Shell"

When dealing with the testing of the eggs in connexion with the natural method of incubation I mention about assisting chicks out of their shells. There is, of course, a great temptation to do so during the early part of the season, and when one is breeding pedigree stock. Some incubator workers never hesitate to render assistance when they deem it necessary, and if any chick does not break through its shell within a reasonable time of starring they pull off the top of the shell and let the chick do the rest. This, however, is a matter which the operator must decide for himself. In my opinion it is much more satisfactory for the chick to hatch of its own accord, if merely because it is a sign of health. And stamina should be the aim of all stock-breeders. Such assistance should be quite unnecessary with eggs which are properly incubated in a standard machine.

It is as well to mention, however, that while there may be a high percentage of fertility when the eggs are tested out, hatchability may be faulty, that is, there may occur what is known as "dead-in-shell." I recollect once reading that, to prevent this, the eggs during incubation should always be kept with the broad or blunt end higher than the small end; it was suggested that this could easily be done by fixing a section of 1½ in. or 2 in. mesh wire-netting in the egg drawer, and putting the canvas on it instead of on the bottom of the drawer. Whether this idea was actually carried out, or merely thrown out as a suggestion, I cannot say; but I have never experimented in this direction, because I am somewhat doubtful of its success.

That "dead-in-shell" does occur more or less in practically every hatch by artificial incubation is an acknowledged fact. It is so, more particularly during winter and early spring than at other times of the year; and although we always hope to get a strong chick from every fertile egg when the incubator has been working evenly under properly-adjusted regulation, we rarely succeed. Great as has been the advance in artificial methods since poultry-keepers in this country first became acquainted with the incubator about sixty years ago, no one has yet succeeded in beating Nature at the game. And, be it remembered, "dead-in-shell" is not unknown when the very best of broody hens are employed for hatching.

In this latter case, what failures there may be are seldom seriously considered, and yet the same proportion in an incubator would probably occasion surprise among novices. To such it would doubtless appear appalling that 15 per cent of eggs put into artificial incubators fail to hatch; but an 85 per cent hatch of chicks as an average throughout the year from hatchable eggs is an excellent result, as experienced workers are aware, and despite the claim made by some people regarding a vigorous chick from every fertile egg. There are scores of fertile eggs which no hen could ever hatch; and what a hen cannot do in the matter is certainly impossible to accomplish by

artificial means. However, when the hatch is a poor one it is most advisable to look into matters; but rather than condemn the artificial appliance it is much better to seek for the cause of failure in the way it has been worked, or the source of the egg supply.

Poor results can be brought about by any of the following causes: A very high or a very low temperature for a prolonged period at some time during the development of the germ; unnecessarily airing and turning the eggs, or omitting to air and turn them daily after the first week; too much moisture or lack of moisture on account of inadequate ventilation of the room; taking the temperature for the egg chamber from infertile or "dead" eggs or from the chamber itself; any sudden jarring of the incubator or in close proximity to it; rough or dirty handling of the eggs; unsuitable oil and untrimmed wicks; faulty adjustment of the regulating apparatus at the commencement; closing the drawer or shutting the door immediately the eggs are put in, instead of allowing them gradually to warm up; putting "travelled" eggs into the drawer as soon as they reach their destination—they should be allowed to remain in their box, broad ends up, for twenty-four hours in a reasonably warm place; opening the machine every few minutes at hatching-out time to see how many chicks have cleared their shells or to help some struggler to get out; running a dirty machine, and particularly in omitting to free the flues and canvases of dust and cobwebs.

These are among some of the little items which may very easily be detrimental to successful incubation. Then, too, lack of vitality in the breeding stock is often responsible for "dead-in-shell"; and this may be due to forcing the pullets for heavy production in autumn and winter and setting eggs from the same birds in spring. Wrong feeding, such as allowing the stock hens to become too fat before they are mated, instead of keeping them in hard condition; putting too many females in the pen; and breeding from immature stock are also causes of failure.

The Percentage Hatched

I have mentioned 85 per cent of chicks hatched as being an excellent result. The importance of setting only high-vitality eggs was demonstrated at one of the American experimental stations. For a certain four-year period 181 eggs had to be incubated for each 100 chicks hatched. During the particular year in which the report was made, and with a certain group of 108 hens, it required 146 eggs to be set for every 100 chicks hatched, when all the eggs from the flock were placed in the incubator. However, by selecting sixty-seven hens out of that flock of 108, it was found, by using the eggs from those sixty-seven birds, that it required only 126 eggs to be set to produce 100 chickens. This proved somewhat conclusively the importance of high vitality in the eggs, a matter which is too often overlooked. It is not sufficient to select eggs in which the chicks will develop up to hatching time; they must have sufficient strength to get out of the eggs, and thus be vigorous from the start. There must be "hatchability" and "livability" as well as fertility; and these are matters which are controlled in the breeding pen. The subsequent result will then depend upon the manner in which the incubation of the eggs is carried out.

To be successful at working an artificial incubator the poultry-keeper must cultivate his powers of observation and exercise common sense. There are many details to be seen to; but, formidable as they may appear when set down on paper, it is surprising how quickly one can become proficient at it when working to a system. It was thought at one time—and some folk even believe it to-day—that artificially-hatched chickens were never as robust as those hatched by hens; but this has long since been proved to be a fallacy. Admittedly, there are many weakly chicks hatched in incubators, but it is the exception rather than the rule for this to be the result of a faulty machine, provided that due attention has been paid to the selection of a standard make.

I have said that eggs which cannot be hatched by hens cannot be hatched artificially. Some authorities do not agree with this, but claim that eggs will hatch in an incubator which would not hatch under a hen. It is certainly not so in the case of those which have been held for some considerable time; and while it might be true with abnormally thin-shelled eggs, which would probably get broken in the nest by the most gentle of sitting hens, I have yet to hear of anyone who has run a machine filled with such eggs only, and I question if it would be successful. They are certainly not the eggs to select for the ordinary method of artificial incubation; and if perchance any with thin shells should get overlooked when the drawer or tray is being prepared, they are not likely to hatch out, because more often than not they get cracked, be one ever so careful in the handling of them.

Mammoth Incubators

So much, then, for the standard or small size incubator, with which the novice is advised to become familiar when changing from the hatching of chicks under hens to the incubating of eggs by artificial means. The average poultry-farmer prefers to hatch his own eggs; and for this purpose he has seldom chosen an incubator of a much greater capacity than

500 eggs. Of recent years, however, there have come into being in this country commercial egg farms, at which thousands of fowls are kept primarily for the production of eggs for the market. At such places it is not the general rule for the actual layers to be retained much beyond their first season; that is, round about twelve months from the time they come into lay they are disposed of and fresh birds take their place. It can be imagined, therefore, that vast quantities of pullets are required annually for replacements; and they must be hatched within a few weeks during the early part of the season to make sufficient growth to enable them to start laying standard eggs in autumn.

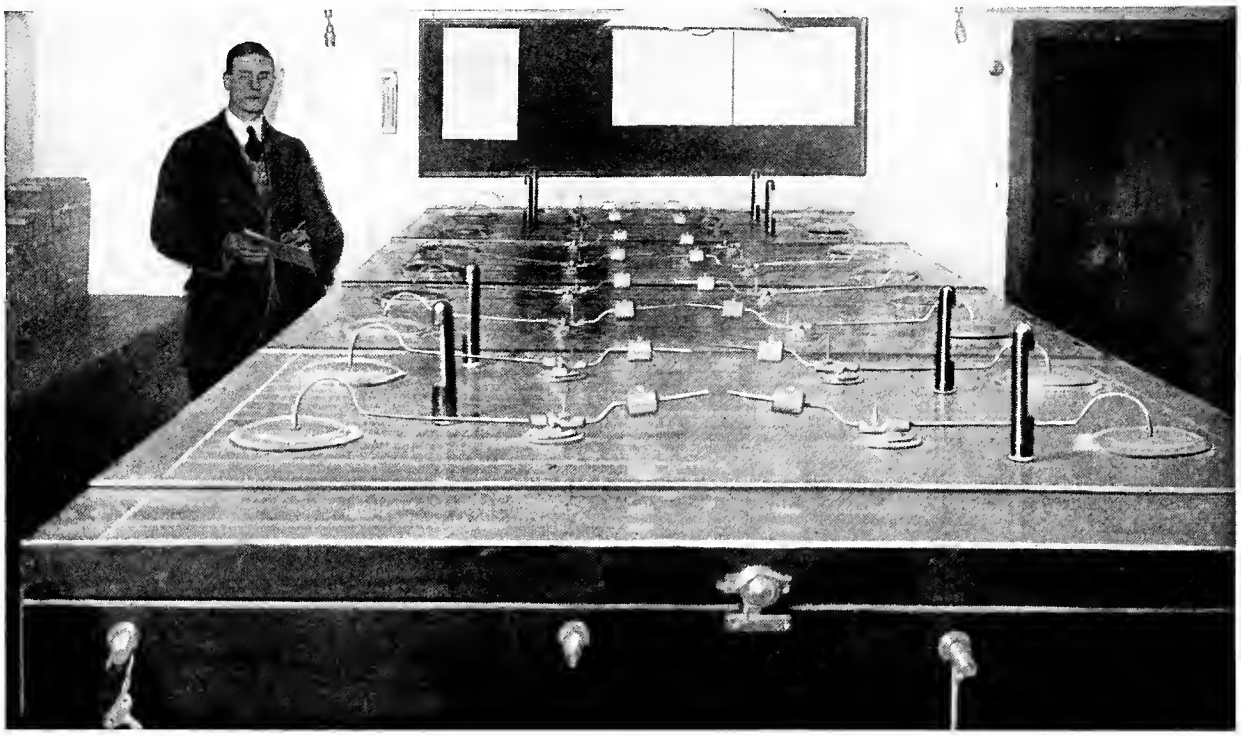


FIG. 97. A MAMMOTH INCUBATOR—SINGLE DECK

Until comparatively recent times it was perhaps the exception rather than the rule at these egg farms for breeding pens to be kept. But at the most up-to-date of them it has been found beneficial to flock-mate the selected second-season hens and to undertake hatching; and for this purpose mammoth incubators are installed. Sometimes, however, the hatching part of the business is turned over to those who specialize in it, and day-old chicks are purchased from commercial hatcheries, at which places, of course, mammoth incubators are in vogue.

This phase of the poultry industry, namely, trading in baby chicks, is not altogether a novelty in our country, and I find I first wrote about it some thirty or more years ago, suggesting it was a paying branch of poultry-farming. However, it is only of comparatively recent times that newly developed equipment has made possible the running of it on commercial lines. Although the supplying of day-old chicks and, in fact, community hatching, like the artificial incubation of hen eggs, are almost as old as the Pyramids —the ancient Egyptian egg-ovens were used for such purposes—it was not much before 1890 that poultry-keepers in this country heard anything about it. In the early 'nineties a hatchery in the United States of America announced publicly that baby chicks were for sale. Not until about 1920, nevertheless, was any real progress made; but to such an extent has it advanced since then that hatcheries existing in that part of the world are said to produce to-day between five hundred million and six hundred million chicks per annum, while some of them have the capacity for one million eggs at a time.

Now, while nothing like such enormous totals have been reached in Great Britain, the few hatcheries which have been set up here during the past ten years or so have gone ahead in a most satisfactory manner; and it is worth recording that, at one of them established in Yorkshire, no less than two million baby chicks were disposed of in the 1934 hatching season

which ended on the 30th June. This, it may be remarked, is an excellent sign of the steady growth of the poultry industry of our country.

However, to revert to the subject of mammoth incubators, it can be imagined that such appliances are well-nigh essential when enormous quantities of chicks have to be hatched, and particularly when the vast majority of those which are required on the commercial egg farms must be available early in the year. At one time the small standard type incubators met all requirements; but they are altogether inadequate for hatching the tremendous number of pullets which are necessary for the supply of market eggs, and, consequently, they are being replaced by those of large capacity.

It may be thought that it would hardly be feasible for the average poultry-farmer or specialist poultry-breeder to install a mammoth incubator for use on his own farm only; that is, to operate it solely for the production of chickens which he required for replacements. That may be so, although it should be governed by the quantity of young stock which had to be raised. Nevertheless, commercial poultrymen working on even a moderate scale know the possibilities of such an appliance. They are stock raisers; their chief source of income is derived from the sale of poultry and eggs for market. They must have their chickens hatched at such a time that the bulk of the cockerels can be marketed at the height of the season, while the pullets must be out early enough to permit of their being reared for egg production from late summer onwards. And by participating in the baby chick business in the spring, when the markets are glutted with eggs, and prices are low, they can turn them into profitable chickens, while purchasers can get what they require when the need is greatest.

Two Types of Machine Available

There are two distinct types of mammoth incubator available, one being generally known as the sectional or horizontal type and the other as the cabinet type of incubator. The former consists of a series of sections, each operating separately but connected one with the other to form a single machine, and heated from a central system. Some models of this type are made in decks, the incubators being so designed that one deck may be placed above the other, thus forming a two-deck or even a three-deck machine heated from the one source. The single-deck model was the first to come into vogue; and in 1908 one of these mammoths set up at a hatchery in New York State was capable of holding 28,000 duck eggs or 32,000 hen eggs, and producing excellent results, as certified by thoroughly reliable American authorities. It was this type of large-scale hatcher which was introduced to England, and I have seen quite a few of them in operation in different parts of the country. Their only drawback was the great amount of floor space they required; but that they hatched well I have had ample proof.

The other type, as its name indicates, resembles a cabinet; and, because it requires very much less floor space and the minimum expenditure on buildings, combined with its greater simplicity in operating, it is certainly supplanting the older sectional and deck type of horizontal mammoth incubator. I think I am correct in saying that the first cabinet machine was patented in 1918 in the United States of America; but considerable improvements have been made in this type of incubator since that date, as scientists and manufacturers have been co-operating in their development. For a number of years only American and continental makes were available; but, to-day, there are several all-British cabinet incubators on the market. And, as models of this most modern hatchery equipment are obtainable from 700 to 70,000 egg capacity, it will be seen that there is a wide enough range from which the poultry-farmer, the commercial breeder, the large flock owner, the general farmer and the hatchery specialist can make a selection to suit their particular requirements.

I have remarked that the artificial incubator is not fool-proof; but, in my opinion, the modern types of British cabinet machine are as near perfection as it is possible to make such appliances, incorporating as they do all the latest scientific improvements. The temperature can be controlled to within approximately a quarter of a degree; and an absolutely uniform temperature is distributed throughout the whole superficial area of the eggs undergoing incubation. The cabinet incubator retains natural moisture, while the ventilation of the incubating chamber can be adjusted to perfection; and thus heat and moisture are scientifically balanced. In short, the latest machines are constructed to cater for every feature in hatching.

It is not necessary for me to go into detail concerning the working of mammoth incubators, because the makers of them supply full instructions with their machines. Suffice it to say that, although one maker does claim that, after a few lessons in the methods of working, any average schoolboy or schoolgirl of standard elementary education can master its details, I do know that a poultryman who is thoroughly accustomed to artificial incubation will not find it too difficult to run a mammoth machine, granted careful observation on his part.

An Expert's View

It will be obvious, of course, that the operating of even the very best make of cabinet incubator requires

FIG. 98. A SECTION OF A DOUBLE-DECK INCUBATOR

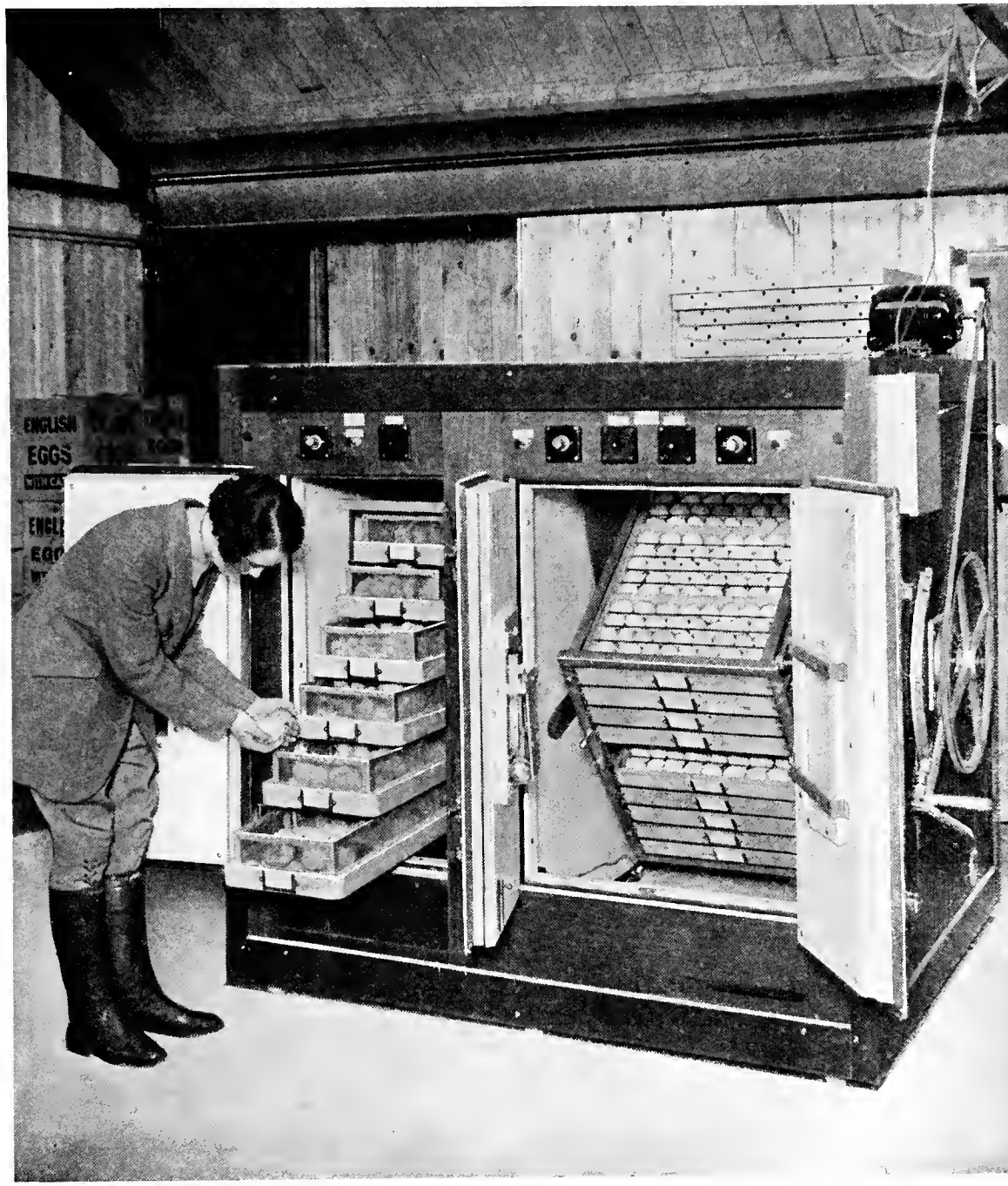


FIG. 99. A CABINET INCUBATOR

The interior of Model B, Hearson all-British all-electric cabinet incubator, showing eggs in one compartment and chicks "hatching out" in the other. This machine is practically foolproof; and the makers (Messrs. Spratts Patent Ltd.) claim that it can be successfully operated by anyone with average intelligence

constant attention, and large-scale incubation is not without its problems. On this subject I cannot do better than quote from a paper which was read at the annual Poultry Conference, Harper Adams College, in August, 1934, by Mr. G. G. Bellfield. Concerning these problems this authority said—

Mammoth incubators of the cabinet type have now been on the market sufficiently long for their "teething trouble" to be over. Incubator manufacturers are to be congratulated for their co-operation with scientists in attaining such a remarkable degree of efficiency and accuracy, not only in cabinet construction, in all the necessary controls and mechanism, but also in the working instruction and service to operators of these machines. One often hears the term "Maker's Instructions" derided, but it must be remembered that the maker's advice is based on tests run under control, when the conditions advised have been checked and proved to be correct. The great majority of cabinet machines rely on some form of motive power for air circulation, and it is here that most problems crop up. A slipping belt, an engine running at too low a speed, a faulty electric supply with a drop in cycles—all set up conditions in a machine which completely nullify the maker's instructions. Again, a broken hinge on a door, or a slack attendant all play their part in setting up adverse conditions in any machine. These factors are essentially ones for the operator to check up before discarding maker's instructions.

Problems do arise, however, which neither operator nor manufacturer can solve easily, and before the solution can be arrived at all the chief factors recognized as affecting incubation must be understood and checked over. Summarizing these we have temperature, humidity, ventilation, position and turning of eggs, and sanitation during hatching. All these factors are closely allied, and, although they must be considered as such, for the purpose of this paper they are treated under separate headings—

Temperature. The master thermometer can and must be controlled to within half a degree variation. The actual operating temperature of the thermometer being dependent on the other factors enumerated can be decided only under test in relation to its actual position in the machine, and although errors in thermometers have been detected, no case has been proved where the maker's instructions should be varied, provided the other conditions are correct. By other conditions is meant: (1) the correct degree of humidity for the temperature maintained; (2) the conditions at the point of reading must be representative of the whole machine—any interference with the designed air circulation may give a totally wrong temperature reading of the machine as a whole; (3) the position of the eggs. If the turning mechanism has become worn it is possible for the egg trays to be too close, thus slowing up the "get away" of the animal heat generated in the egg. Conversely, if the turning mechanism is sticky and incorrectly set, the temperature of the actual egg may be lower than required in relation to the master thermometer, and the angle at which the eggs lie may be incorrect for full and complete development of the embryo.

Humidity. The importance of controlled application of moisture in incubation has only been fully realized in recent years. Correct humidity bears a very important part in producing a quality chick in length of down, pigment, and weight, as well as preventing the germs sticking to the air cell or egg membranes, and enabling the chick to slip easily out of the cell at hatching time. The exact degree of humidity presents many problems and depends on: (1) Temperature (it has been found that a rise of 8–10° in the wet bulb reading requires temperature reduction of $\frac{3}{4}$–1 deg.); (2) Rate of air circulation and freshness of air circulated; (3) Texture of egg shell, age of egg and method of storing during the pre-incubation period.

Porous types of shell or eggs which have been stored a long time or in such a manner as to encourage evaporation naturally require more humidity than good texture eggs of four days old. Strong shelled eggs, $2\frac{1}{8}$–$2\frac{1}{4}$ oz. in weight, present more problems and call for special attention. Under large-scale incubators, far too many of these best eggs (which produce first quality chickens) fail to hatch and this is a disturbing fact, especially when it is found that as flock improvement progresses the egg size and shell texture improve, but hatchability decreases unless conditions are altered to meet this progress. It has been found in dealing with such eggs that a reduction of humidity to as much as 5° in the wet bulb reading with a corresponding increase in temperature of $\frac{1}{2}$° for the first eighteen days of incubation will bring the air space more nearly to normal and improve results. This problem deserves further attention and careful investigation.

Ventilation and Turning. These conditions are specially noticeable in custom hatching work, where consignments of different types of eggs subjected to different handlings and methods of storage give varying results if subjected to standard conditions of incubation. Ventilation in the machine is primarily a subject for manufacturers and the most the operator can do is to ensure efficient working of the mechanical devices supplied for the purpose. Closely allied to ventilation of the incubator is, of course, the ventilation of the incubator room. Apart from the economic fuel or electric consumption and the ease and comfort of handling baby chicks, fresh air in the incubating room is far more important than temperature. Draughts, especially a current of cold air directly on to inlet or outlet vents, must be avoided. The turning of eggs should not be guided by the convenience of the operator. The twenty-four hours should be divided as nearly as possible in equal parts, preferably six-hourly—or four times in the twenty-four hours. The more frequent turning of eggs does unquestionably increase hatching results, seeming to give a more complete development and reduce the number of malpositions.

Probably the most important problems in large-scale hatching lie in sanitation and hygiene. To embark on such work without realizing the importance of this would be nothing short of criminal, and it is of vital importance to impress on all operators that cleanliness and a high standard of hygiene throughout are essential. This can best be done by seeing that the buildings, surroundings, and plans of operation are conducive to cleanliness and by insisting on certain standards as a matter of routine.

Sanitation. Assuming that the importance of this is acknowledged by those responsible for the pre-incubation period, and that eggs going into the incubators are clean, produced under hygienic conditions, and come from disease-free birds, then what are the essential points in sanitary incubation? Obviously the room in

which the machine is housed must be the first consideration, since, in nearly all cases, the incubator draws its air for ventilation from the room in which it is housed. This air contains dust particles which can carry millions of bacteria, therefore the incubator can only be as clean as the room in which it is housed. The floor of the incubator room is the source of most dirt and dust. This must be kept clean and preferably damp to prevent dust. Regular scrubbing and swilling down, or using a vacuum cleaner when dry, are preferable to dry sweeping.

If the incubator room is viewed in this light, such practices as throwing egg shells and rubbish on the floor, brooding chicks in the same room, or allowing those working with outside stock to come into the incubator room without disinfection must be condemned. Even hospital conditions in the incubator room will not suffice unless the incubator itself is regularly and systematically dealt with, since conditions conducive to good incubation of chicks are also ideal for the rapid growth of bacteria. Egg shells, fluff, and fæcal matter must be removed after each hatch, and trays and floors scrubbed with a good disinfectant.

It should be a common practice to disinfect the whole machine after each hatch, and this can be done most easily and efficiently by means of formaldehyde gas (using 40 cc. formalin and 20 grammes of permanganate of potash to every 100 cub. ft.). Experiments conducted by Professors Dakan and Spencer, of Ohio State University, and recently confirmed by Graham and Michael, of the University of Illinois, show that when used at this strength this gas has no injurious effect on eggs or metal and will readily destroy the bacteria of bacillary white diarrhoea. The effectiveness of this gas is greatest in an atmosphere with a high humidity and a wet bulb reading of 90° F. should be obtained before commencing disinfection. It has been found that the most convenient time to do this is after the hatching trays have been scrubbed, when, if they are replaced in the machine damp the humidity rises without further trouble.

Real problems in incubation, or in bad rearing results attributed to faulty incubation, can be dealt with only by checking over each of the conditions and points outlined, taking nothing for granted, until the solution is made by a process of elimination. There is, unquestionably, still room for improving and simplifying the means and methods of incubation, but it is felt that there is more room for improvement in pre-incubation practices and hygiene during incubation, than in the mechanical efficiency of modern mammoth incubators. In other words, an efficient incubator is not enough, it must be efficiently and intelligently used.

Putting Day-old Chicks under Broody Hens

Although not coming strictly within the incubation of eggs, it may be mentioned that there are novices at poultry-keeping who, not having the time, the inclination, or the scope to undertake hatching, begin with day-old chicks. This branch of the industry has grown considerably of recent years, even though large quantities of eggs for setting are disposed of annually, while there are many breeders who mate their own stock. However, poultry-keepers who would begin with day-old chicks and wish to rear the birds by hens, should make sure that the right kind of hen is chosen for the purpose. Most broodies which have been sitting for a week or more, in the ordinary layer's nest, or on dummy eggs in a sitting box, will take to chicks if they are properly managed. On no account, however, should it be attempted with a hen which has been broody for less than a week, because during the first few days of her broodiness, she naturally sits very closely. Hence she would probably smother any chicks given to her. Moreover, it is always advisable to get her accustomed to her attendant, so that she can be readily handled and will not get flustered when approached and thus be liable to injure the chicks.

A hen which has to be employed for the purpose should be well fed when she leaves her self-chosen nest at the usual time; and then, with the eggs she has covered, put into a rearing coop. She will soon settle down if she is really broody. The chicks should be taken from their travelling box as soon as they arrive at their destination, and accommodated in a temporary dryer, such as I have already described. Then, in the evening, take the dryer up to the rearing coop and put three or four of the chicks under the hen, at the same time removing the eggs. If she croons to them let her have the remainder of the batch; but if she is restless and pecks at the chicks, return them at once to their temporary mother, and keep them there until another hen is secured. Rarely, though, is this necessary, especially if the attendant is patient and gentle in the handling of the hen. And such he must be, if he wants her to take to day-old chicks —and himself succeed at natural rearing. Even now I sometimes have occasion to put a dozen or more day-old chicks under a hen when rearing them for some particular purpose; and it is out of the question to run an artificial foster-mother for such a small number. But, although broody hens may have to be brought in from outlying farms, I never have any trouble in getting them to take to the chicks. It is simply a matter of gentle handling. However, more of rearing in the chapter which follows.

CHAPTER VI

THE BROODING AND REARING OF CHICKENS

To brood—to sit over and cover. To rear—to bring up. As surely as night follows day, so surely must chickens be brooded to be reared. Brooding is the natural and essential sequel of incubation, whether that incubation has been effected by the hen, or by the ingenious substitute invented by man. It is not enough to hatch well, that is, to produce by natural or artificial means chicks which have within them the maximum of physical fitness when they are hatched. Admittedly, this gives them a much better chance than weakly chicks to withstand the vicissitudes they encounter in most methods of artificial brooding, until

FIG. 100. A HAPPY FAMILY

A Rhode Island Red hen with the brood of Light Sussex she hatched in April. The chickens were liberated at a week old, when this snap was taken. In the background is an ark for growers

they can accommodate themselves to the conditions. To rear well, therefore, must be the aim of all who would succeed with chickens.

It is a mistake to imagine that adult stock will give satisfactory results unless the birds have been carefully brooded and reared. What we want are healthy, vigorous, well-furnished fowls with sound flesh and good muscles, so that they shall be disease resisters. This end can be achieved in no other way than by correct rearing. What that means, what successful rearing involves, is known only to those who have actually done the work themselves. It covers such a wide field, because there are many objects for which chickens can be brought up; and more than one way of doing each.

What Good Rearing Means

Briefly, rearing amounts to nothing less than paying almost constant attention to the birds for the first six or more weeks of their lives, and then never neglecting them until they are ready for the particular end in view. To have chickens well reared for market means that the cockerels must be almost fully grown, yet plump and tender-fleshed for the table, which is no easy task when one is catering for the spring trade; for egg production, having the pullets sufficiently advanced to commence laying sizable eggs in late summer, when prices are on the rise, and thus ensuring the birds being in their stride and steadily producing standard weight eggs to secure the best prices of late autumn and winter; for stock, getting the male birds properly furnished by the time it is necessary to mate them up for the first breeding pens of the season; for show, having them, particularly the cockerels, beyond their raw and gawky stage, and fit enough to make an impression on the judge. There is much in good rearing; and no matter what be the object in view, it is always a paying proposition to look to the welfare of the young stock. If chickens be given a good start they will relieve their attendant of much anxiety in their growing stages, while, as the finished article, they will more than repay him for the extra care he has expended on them. The man who builds up a reputation for quality chickens can practically command his own price.

Just when to hatch them out is a matter which I have already dealt with in Chapter IV, when treating of the mating of fowls; as the birds are mated, so in due course we expect the chicks to arrive. Many authorities suggest March and April as the best months during which to hatch pullets for winter laying; and yet, because it can be managed so easily nowadays by artificial methods, prospective autumn and winter layers of the general-purpose breeds might well be hatched in January, and other kinds a month later. Of course, table chickens for the very early markets should be out by mid-winter or before Christmas. Birds which are to be developed for stock may be hatched at almost any time in winter and spring, at any rate during the first three months of the year; but on no account should fowls be hatched before 1st November if it be intended to exhibit them in "chicken" classes at shows which are held under Poultry Club Rules—otherwise they will be disqualified.

I have seen it stated as "an undeniable fact" that chicks which are hatched from 1st November to 31st January are more robust, grow more rapidly, mature sexually at an earlier date, and have a greater resistant power to disease than those which are later hatched. I do not find it so in practice. Admittedly, chickens hatched at midsummer may not perhaps

compare favourably with those hatched in January; but much will depend on the condition of the breeding stock, the state of the weather, and the way in which the birds are reared. No attempt is made to develop summer chickens along unnatural and so-called forcing lines; they are allowed to grow in a natural way. And if the weather be normal they will benefit by the sun, the extra hours of daylight, and the natural food they can and do obtain. Too frequently summer chickens are left to themselves, and that is why they do not thrive; but if proper attention be paid to them they will develop into very profitable stock.

Natural *v.* Artificial Methods

However, with regard to brooding and rearing, chickens can be brought up with equal success either naturally or artificially. And, despite all that has been accomplished by research workers and scientists in connexion with the subject, there are still thousands of poultry-keepers, and among them, stock-breeders of pedigree fowls, who depend solely upon broody hens for rearing their chickens. As I mention in the preceding chapter when dealing with the sitting hen, some rearers find that a hen raises better chickens than those brought up artificially, in that they grow harder and more vigorous, are more solid in the hand, and feather in a better manner. And yet, a well-known pedigree breeder—who commenced his career as a poultry-keeper some years ago on my advice, and has since been most successful with his birds at laying tests—recently declared that he does not let hens rear his chicks, because he finds that hand-reared ones, i.e. those brought up artificially, come on better, while the hen-reared chicks are usually wilder; and hens so employed are "out of profit."

That hens which have charge of chickens are out of profit as far as egg production is concerned is, of course, true; hence, those which have gone broody very early in the year and have been allowed to sit for three weeks, might well be put into the breaking coop and brought into lay again while egg prices are still high. Then, too, one secret of heavy production is having the layers tame and contented. But this matter, as well as the manner in which the chickens are grown, the way in which they feather, their vigour and handling, depends entirely upon the man in charge. If he knows his business he will see that the chickens get accustomed to him; he will not unduly scare them, working quietly and not attempting too much. There is such a thing as hen sense; and he who possesses it will make a much greater success of chicken rearing than he who blunders about. The chicken ground is no place for the clumsy fellow who seems to take a delight in making the birds scatter.

Neither is it advisable, when many chickens are being reared, to attempt to attend to layers and stock birds as well; and the employer who expects it of his poultryman is asking too much. Even during the early season, when, as we say, the days are short, and, frequently enough the weather is such that outside exercise cannot be permitted, it takes up quite a lot of one's time attending to chickens, because they must not be kept entirely without food between sundown and sunrise. They require early and late feeding; and granted they are being reared on the very latest lines, they always want attention. It is lack of it, due too frequently to stress of work in other directions, which almost invariably results in troubles among the youngsters. When commencing with chickens, therefore, the novice is well advised not to attempt too much; so if he be single-handed, as will probably be the case, let him take an old timer's hint and confine his efforts to a modest two hundred chickens if rearing them artificially, or half that number if they are being brooded by hens. He will find such clutches quite as much as he can manage until they are "off brooder heat"—until they can be more or less left to get along without the warmth of the hens or the artificial foster-mothers—granted he has also to attend to the laying stock.

The Hen and Her Charges

Perhaps the most important part of natural rearing is providing the hen and her chickens with suitable accommodation. At any rate, while they must be fed, it is essential that they be well housed, and especially throughout winter and early spring. There are times when complete freedom may be allowed, when the chickens may go where they fancy; but conditions prevailing during the early part of the year are not always such as to permit of outdoor exercise even in the most sheltered situation. After all, winter is not the natural rearing season; hence, if we wish our chickens to thrive then, provision must be made to ensure comfort for the birds during inclement weather. For this reason, and also because I, personally, object to cramped quarters, I always see that the coop for the hen and her chickens is large enough to give them room in which they can spread around if they feel like doing so; and I put it where they can get a dry spot in which to exercise. Moreover, roominess of the coop enables the hen to stretch her legs, and it obviates any tendency to cramp, because, as very frequently happens, she has to be confined to it most of the day during the first two to three weeks. Outdoor coops must be substantially made, and practically watertight; and $\frac{3}{4}$ in. tongued and grooved matchboarding will not be too heavy timber to use to enable them to stand up to the weather.

As can be ascertained from the price lists issued by appliance makers, chicken coops are obtainable of different shapes and sizes; and no doubt each of them has its advocates. Nevertheless, I prefer the double compartment model I brought out many years ago, and which has since been widely copied. It possesses so many advantages over the usual type that it cannot be excelled. The single coop is still largely in vogue; but for early rearing it is useless for outdoors. Admittedly, when one is dealing with winter chickens, a shed is an excellent place for the broods with the hens; but many poultry-keepers who go in for natural hatching do not possess such accommodation. Hence, for them the double coop is decidedly preferable. Rain which is driven through the front of the ordinary coop drenches the hen and her young, because they cannot get out of its way, while during heavy showers it is apt to soak the litter. And it does not require any stretch of the imagination to see what a detrimental effect this is likely to have on the chickens. In the double coop these disadvantages are avoided; and when it is in use there is really no need to have a shed, particularly if the rearing ground is in a sheltered position.

FIG. 101. A FINE BROOD
Five-week-old Buff Plymouth Rock chickens and their mother

A Double Compartment Coop

The measurements of the coop I advocate are not so very important, provided the length is 3 ft. or more. I make most of these appliances for my own use; they are generally made in sections and fitted together with screws, so that, if the necessity arise, they can be readily dismantled and packed away in the minimum of space when not required. As a rule they are on the "lean-to" principle, the roof sloping downwards from front to back, as this style is much easier to make than the apex roof. They are about 4 ft. long, 2 ft. high in front, 1 ft. 9 in. at the back, and 2 ft. deep. However, the exact measurements depend on the boards which are handy, because I always endeavour to prevent cutting timber to waste. The back, the ends, and the roof are solid; and so is half the front, to ensure the birds having a snug place in which to sleep, and adequate protection from the rain. The earliest models I made had a partition which was barred, inside, so that the hen could be confined to the nest section for the first few days; but this I have discarded, allowing her to use the whole of the floor space, even though she may, as occasionally a hen does, use the litter as a dust bath. The open part of the front consists of a barred door, the bars being plasterer's laths, placed perpendicularly, and fitted about 3 in. apart. This arrangement is very much better than the ancient one of having the two centre bars movable and the others fixed, since when the time comes to liberate the hen with her chickens it is decidedly more convenient to open the door than to fiddle about with bars. Moreover, loose bars are so apt to get misplaced.

Each coop has a shutter to protect the inmates at night time. In some of mine the shutter is made to slide, but in the latest I have turned out, it fits into a couple of slots at the bottom, and is secured at the top by a button. In neither case, however, does the shutter close the entire front, since, for ventilation, about 2 in. to 3 in. are left open at the top. Half a dozen or more 1 in. holes are also bored along the tops of the ends and the solid part of the front. Far more chickens are injured by overheating or foul air in the coops than by cold; so when the place is closed up for the night the atmosphere must not be too stuffy —let them have the chance of breathing fresh air, even in winter. For summer use, the shutters are made of wire-netting on a wooden frame, over which is tacked a piece of gunny or hessian. The centre of the roof consists of a trap-door, which can be entirely removed, so that it is possible to handle the hen from above. These traps are either hinged or just kept in place by cord from front to back, or by a wooden button on each side. They are made in the roof, because the hens can be better managed from above. It is a simple matter to lift a fowl with a hand on each side, but a most troublesome undertaking for me to go on my knees and attempt to drag her out—so much of a nuisance that I do not indulge in that form of exercise.

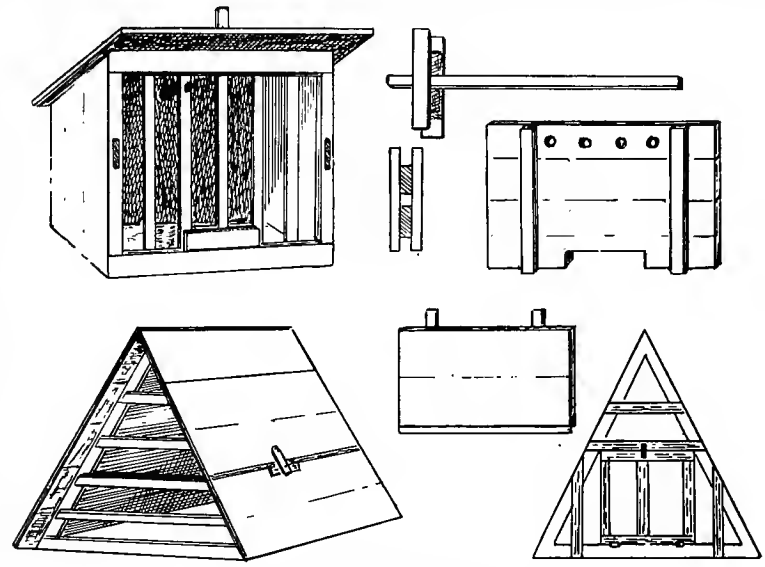


FIG. 102. SINGLE COOPS

Top. The square coop, the centre bar of which is made to slide through the roof, to release the hen when necessary. A wooden shutter (shown on the right) is beneficial for night use in winter. It should fit to within an inch of the top and be buttoned on to each side

Bottom. The apex coop with fixed horizontal bars. The door (depicted also in the centre) forms part of the roof and is easily kept in place by means of a button. Some coops of this kind have fronts similar to the one shown on the right

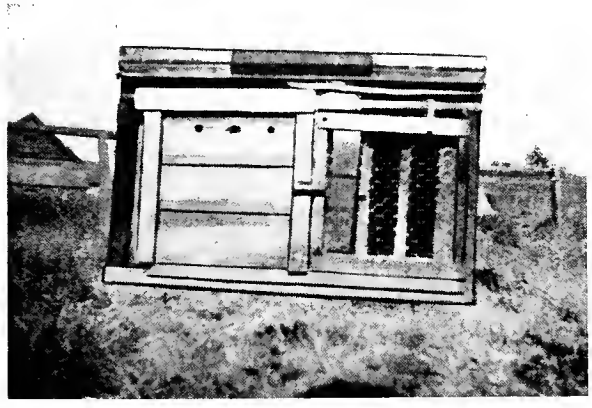


FIG. 103. A DOUBLE COMPARTMENT COOP

There is the floor to be considered; and the coop must have one, even though some authorities assert that chickens should be brooded on the ground because a floor causes the youngsters to develop leg weakness and similar troubles. Such, nevertheless, is not my experience, even when plain boards are used. Some of the floors of my rearing coops are so made, of wood, and to lift out, while others consist of tarred sacking over wire-netting and kept in place by three or four laths. In either case, though, they are always covered with litter, old straw well broken or cut into "chop," sometimes coarse sawdust or granulated peat moss, but never hay. A hay nest is warm, admittedly, but it is generally too warm; in addition to which it is apt to harbour lice, while it is much more quickly fouled than straw or sawdust. Put a fair covering of litter on the floor, enough to prevent the chickens sleeping on bare boards, but not so much that they will get buried in it.

Temporary Runs

It is obvious that an outdoor coop must have a bottom for use in winter, if merely to keep the birds dry and warm while they are sleeping. But it is beneficial in another way, because it enables one easily to confine the chickens to the coop when a fresh place has to be found for it. And this is a point which must be watched, because if the ground in front, and immediately around the coop, is allowed to get foul it is likely to cause trouble. A weekly move, if only a few feet, may be necessary, but this is a matter which the attendant must decide. Cleanliness must be observed; the floor litter in the coop should be shaken

up daily and the bulk of the droppings removed, probably the most convenient time for doing so being when the birds are having their breakfast.

The location of the coop must not be overlooked. If a shed or a vacant fowl house is available by all means use it. Otherwise, it is advisable to select a dry spot which is likely to catch the sun. It should face south and be protected from wind; hence a suitable site is on the south side of a hedge, a fence, or a wall. If none of these be available there should mesh for the top; and sacks are used as protection from the rain and wind.

Years ago, when I did much early rearing by hens, I made these temporary runs almost as substantial as scratching sheds. They had apex-shaped roofs of ½ in. boards, which were felted like the ordinary fowl house, the roof being carried well over at the eaves; and 9 in. of boarding was fixed along the bottom. These small covered runs enabled the chickens to get plenty of outdoor exercise, at the same time affording them

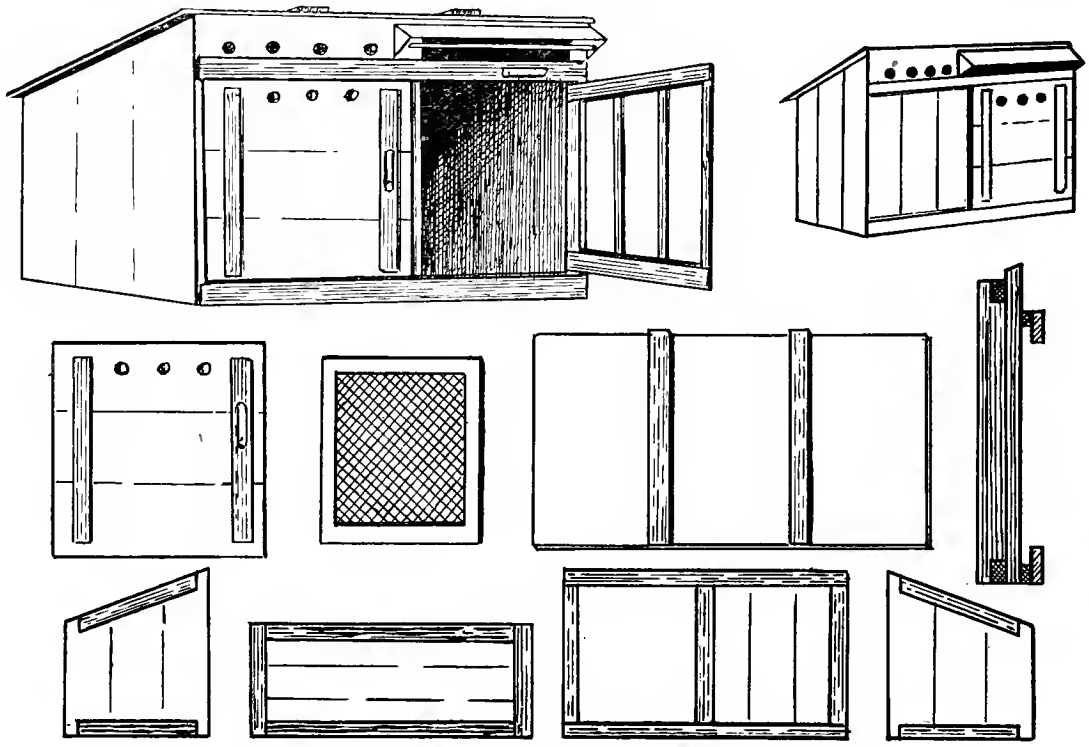


FIG. 104. THE DOUBLE COMPARTMENT COOP AND ITS FITTINGS

Top. The coop shown with the front open and, on the right, closed for the night

Centre. The wooden shutter; the wire-netting front to fit over the bars in warm weather so that the wooden shutter may not be used; the roof, the centre section of which is flanged to form the door, the other parts being screwed down; and a section showing the slides for the shutter

Bottom. All the framework which is required for the ends, the back, and the front. The coop should be fitted together with stout screws

be a substitute, particularly to protect the coop from strong winds, and to provide a reasonably dry place in which the birds can exercise. The early days are the most critical of a chicken's life; consequently in what we term the winter months, it is as well not to allow chickens to have much outdoor exercise until they are three to four weeks old. It is certainly folly to force them to run out when they are merely a few days old. However, if perchance the coop must be in the open, I attach a run to it. This is 6 ft. long, the width and height of the coop, and made of wire-netting hurdles, of 1 in. mesh for the end and the sides—to prevent the young birds straying—and 2 in. protection from rain; and some such attachment to the double coop will answer well for those who rear chickens in a garden at any time of the year. Shelter there must be in winter—something to break the force of the wind and provide the birds with a resort from it and the rain. The double compartment coop, I may add, will hold the usual clutch, a dozen or so chickens until they are old enough not to require the hen's warmth; and then, if fitted with a slatted floor and set on four bricks, it will make a suitable house for half a dozen or so pullets almost to their laying stage. I have often used the coop for such a purpose when rearing Leghorns and other light

breeds, and have, moreover, let the cockerels roost in it.

Feeding the Mother

Now with regard to the hen, she must not be neglected. It is expedient to confine her to the coop for the first two or three weeks in the early season, even when a temporary run is attached; and during that time she must be treated as in her period of sitting, that is, removed once daily to feed and to stretch her wings. Let her have grain only, kibbled maize, wheat, or the usual mixed corn. She may perhaps refuse to eat at first, being anxious to get back to her chickens, as they invariably set up a

FIG. 105. A COMBINED COOP AND RUN

The dimensions of this combination—which will answer also as a fold for chickens—are 2 ft. each way and 5 ft. long. There is a sliding floor and one sliding panel of wire-netting as shown. When this appliance is used for a sitting hen, the floor is removed, a hollow made in the ground, and peat moss used as the nest material. At feeding time the door (hinged to one side) is opened, the hen lifted off, and allowed to return in her own time

plaintive cry when she is taken from them. However, if gently treated she can generally be persuaded to take a meal. If not, she must be returned to the coop after she has had her exercise, and be permitted to eat the food put down for the chicks. Some hens prefer to do so; and as it is useless trying to argue with an obstinate broody hen—and unwise to lose one's patience over such a trivial matter—let her have her own way. This special diet will be slightly more costly than the usual grain; but she will probably not take a great deal of it, and will certainly not let her chicks go short, while such food will bring her into condition again and do much to start her laying almost as soon as the youngsters are out of her care.

When the hen is returned to the coop after the daily exercise, especially if it be the first time she has had charge of chickens, she may unwittingly step on one or two of them, as they generally crowd around her when they hear her call. Still, healthy chickens are much stronger than they appear to be; and such rough treatment does not have the least detrimental effect on them, because when released they will jump up as if nothing untoward had happened. Of course, one may occasionally have a clumsy hen; but such a bird is the exception and certainly not the rule—if

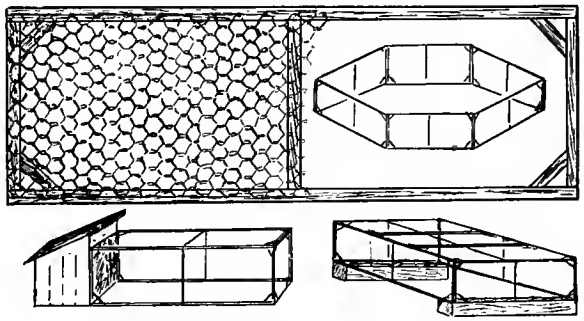


FIG. 106. A USEFUL FENCE FOR CHICKENS

Fence units are very useful during the rearing season. Convenient sizes are 6 ft. and 2 ft. long and wide enough to take the width of 2 ft. netting. Mine are made of 1 in. square deal, braced at the corners, and the 6 ft. length braced through the middle also, the frame being creosoted before the netting (1 in. mesh) is fixed. Three 6 ft. lengths with a 2 ft. end make an excellent covered run for a hen cooped with her chickens, while half a dozen of the long frames used end to end form a suitable enclosure for growers. A handy feeding cage can be made with seven of them, the cage being stood on lengths of old beams or four bricks. When growers of different ages are ranging together, the cage enables the smallest birds to feed in peace

the attendant knows his business. It is simply a question of patience; always handle hens gently.

So much, then, for chicken rearing by natural means, as far as accommodation is concerned. If it were possible to utilize hens for brooding in large quantities at any time of the year on as economical

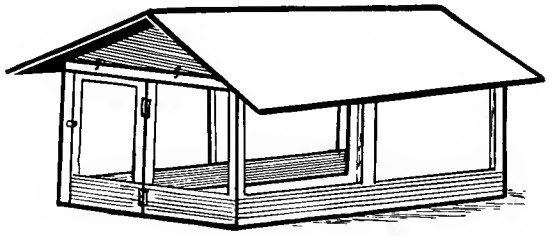


FIG. 107. A COVERED RUN FOR USE WITH A SINGLE COOP

The run is 4 ft. long, while the width and height are such as to make it to fit closely to the front of the coop. The sides and end are fitted with 1 in. mesh wire-netting

a basis as artificial brooders these latter would probably not be popular. As it is, though, commercial poultry-farming cannot possibly be carried on without artificial methods of incubation and rearing. Moreover, the laying stock is the source of income; and, in the season of high prices, hens and pullets are certainly out of profit when they are allowed to indulge in their natural tendency to brood. Hence it is that, on the first sign of broodiness, they should be removed to the special coops to be brought into

lay again in the shortest possible time, and all brooding be done mechanically.

Artificial Methods

It may be thought that I have somewhat dogmatized on the subject of natural rearing; and yet, there

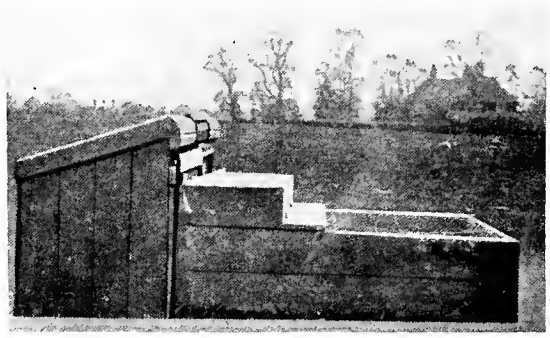


FIG. 108. A DOUBLE COMPARTMENT COOP WITH RUN ATTACHED

The run is made of ⅞ in. boards. The only open part is about two-thirds of the top, of 1 in. mesh wire-netting. The box top of it is hinged to the cross board, so that it can be opened to attend to the hen, and for feeding

is really only one correct way of treating a hen and her chickens. This is not so, however, with artificial rearing, because, although the principle is the same as that of the brooding hen, there is as much variation in the make of the artificial foster-mother as there is in the incubator; in fact, more so, when one considers that it ranges from the fireless to the battery. The essential factors throughout are warmth, fresh air, light, and dryness; but the manner of providing them differs very much in detail.

During the many years I have been specializing in poultry I have experimented with practically every system of artificial rearing which has been made public, and some which have not, even in my young days succeeding in bringing up a brood of Old English Game by the warmth of a storm lantern in a pigeon-cote. But, while each system now in vogue has its good points—and probably, also, its bad, because there can scarcely be any which is 100 per cent perfect in all circumstances—I am not prepared to recommend one in preference to all others. The futility of doing so will be evident when I say that there are a considerable number of quite distinct types of brooder in common use, and a large number of makes of each type, and each type has its own staunch supporters. There are scores of brooders on the market which can be successfully worked by anyone who cares to pay attention to details. Like incubation, success in this direction means using one's common sense. Lack of attention invariably results in failure. When chicks are "hatched strong" it is up to the poultryman to see that they are carefully reared. In this matter particularly it is often better to rely on one's own sense of what is right than upon second-hand experience. After all, chicks are much like children; and anyone who understands kiddies is able to sense whether or not the youngsters are comfortable and thriving. The ability to do this is really what counts, and that is why women, as a rule, make the most successful rearers.

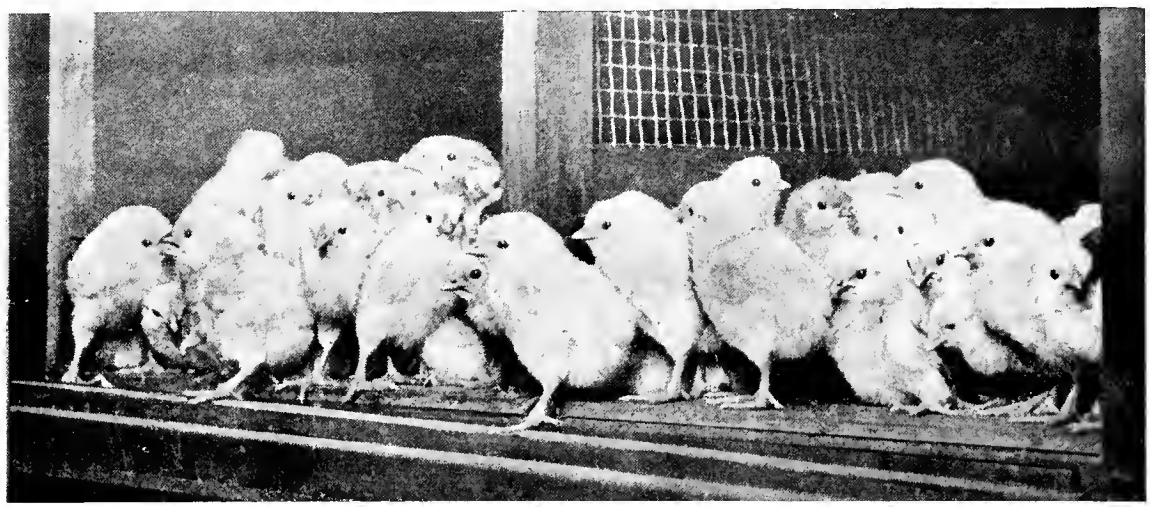


FIG. 109. "JUST OUT"

A brood of sturdy chicks in the incubator in which they were hatched, and ready for removal to the rearer

It is seldom in these days that the hot-water system of ground rearing is practised, much as it was advocated a few years ago; and when heat is applied it is by means of oil or electricity, but mostly by oil at

present. Artificial methods can be divided broadly into three sections, viz. the small unit up to about 150 chickens, the flock system up to 1000 or more, and the battery; but each has several sub-divisions, while there is the "fireless" as well as the warmed brooder. The novice would scarcely be tempted to experiment with large flocks or the battery system until he has thoroughly mastered the general details of artificial methods on a moderate scale; and I certainly advise him to begin in a small way, since rearing will be one of his stiffest problems and calling for strict attention to details. As in natural rearing, the early days are the most critical in a chicken's life, and the least carelessness then is almost bound to result in failure. Chickens which are developed without a check are those which pay for their rearing, no matter whether they are destined to be killed for market or grown for laying or stock purposes. The rearer must never let his young birds come to a standstill.

The Small Unit System

This, as stated above, embraces practically any kind of artificial foster-mother to care for up to 150 chicks, some of which are for outdoor use while others require a small room in which to operate them. The small unit includes the "fireless" or lampless brooder, which is quite distinct from the type that poultry authorities know as a cold brooder, although the two are apt to be confused. The fireless is a cold brooder in the sense that artificial heat is not applied in any way, since the heat is supplied and conserved from the bodies of the chicks themselves. But whereas it is for use from the time the chicks are just hatched out, the cold brooder is an appliance used by some poultrymen as a suitable house for chickens which are off brooder heat—when they are about six weeks old—and before they are sufficiently developed to roost in chicken or adult houses. Nowadays, however, these cold brooders are being gradually dispensed with, since it has been found that the change from the brooder house to outside conditions is best accomplished by putting sacking or long straw over the slatted floor of the chicken ark.

The Hay-box Brooder

The fireless brooder is made in two styles, as a single box or nest, and as a double compartment appliance. But no matter which kind is used, this system of brooding chickens is successful only with unremitting care and attention. I should hesitate to advocate its use as a commercial proposition, and simply because of the great amount of time which is taken up in attending to the birds. And yet a friend of mine, with the assistance of his wife, successfully reared nearly 2000 chickens in fireless brooders throughout one winter and spring in the south of England. I am well aware that excellent chicks can be so reared. I gave the system a trial during one summer and it was in every way successful; but several attempts with it at other seasons of the year, and particularly for winter chickens, were so disastrous that I was forced to abandon it as uneconomical. As a paying proposition I wrote it down as useless. The chickens demanded so much extra attention until they got accustomed to finding their way back into the hay of the sleeping section for warmth that, rightly or wrongly, I decided my time could be more profitably employed attending to birds being reared by heat.

However, those who have been successful in the early part of the year with fireless brooders of the

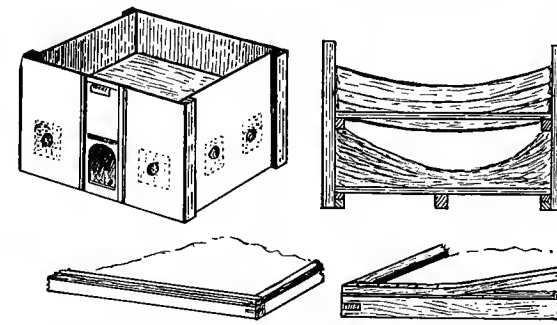


FIG. 110. THE HAY-BOX OR SINGLE NEST FIRELESS BROODER

The section, on the right, shows the blankets and the hay nest ready for the chicks
Below are shown parts of the top frame and the method of securing the muslin by means of a thin strip, such as a lath

single box or nest type assure me that they are best operated in a substantial fowl house with an all-glass front; and that, while the brooders may be put outside for an hour or two on sunny days, they are not suitable for constant use out of doors, and the most important part of their management is to guard the chicks against chill. This I can quite realize, because no matter what system of artificial rearing is adopted, chilling must be avoided at all times. Even during springtime in our country the wind is often cold enough to chill the most robust of chickens; hence, for choice, the chicken range should be in a well-sheltered situation. Fifty chicks is the maximum for the box type of fireless brooder; and for such a number, a suitable size is 2 ft. square and 1 ft. 3 in. high. The nest must be thoroughly dry, so it is essential to cover the floor of it with waterproof felt. Hay must be packed in, leaving a space only large enough to take the chickens. About 1 ft. up, and held on ledges, is a wooden frame covered with butter muslin, over which are placed three or four small blankets, which cause the muslin to sag and thus fall on the backs of the chicks. This frame and the floor

must be movable for cleansing purposes, and remaking the hay nest. Ventilation is necessary all round the box, two 1-in. holes being drilled on each side and covered with perforated zinc. The box should be

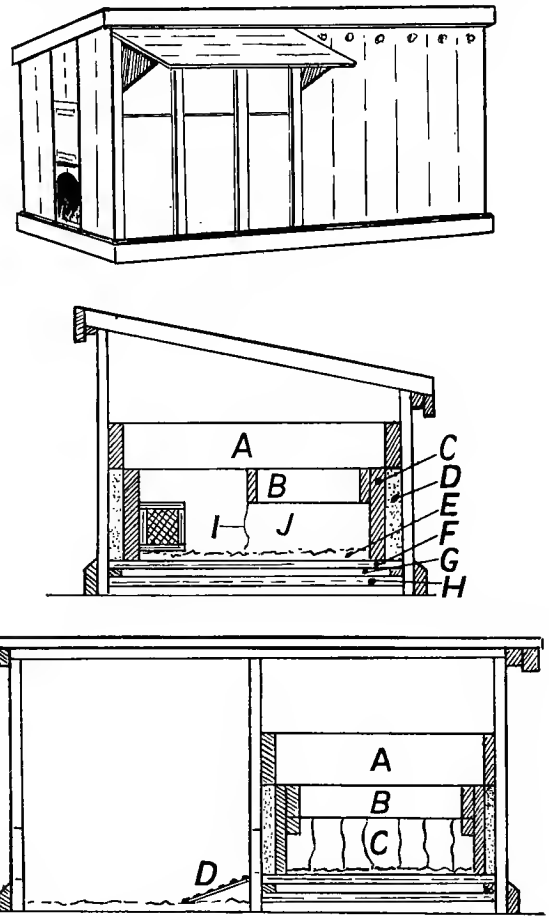


FIG. 111. A DOUBLE COMPARTMENT FIRELESS BROODER FOR OUTDOOR USE

The top sketcb explains itself; it shows the complete brooder with a "weather-board" along tbe top of tbe front, this latter being fitted with 1 in. mesh wire-netting and three movable glass panels

In the cross-section, *A* is the upper cbaff tray; *B* the lower cbaff tray with canvas bottom; *C* the inner wall of 1 in. board; *D* the space between the inner and outer walls, which is packed with sawdust; *E* the litter; *F* the actual bottom; *G* the air space; *H* the outer bottom; *I* the flannel curtain; and *J* the sleeping compartment. The small wire-netting trap-door between the inner and outer compartments is also shown

The longitudinal section is, no doubt, clear enough—*A* and *B* are the chaff trays, as above, *C* the flannel curtain, and *D* the ladder from the small wire-netting trap-door, to enable the birds to leave and enter the sleeping chamber. Fillet supports are shown under the bottom chaff tray

fitted with a lid to prevent the birds perching on the edges and fouling the blankets.

The Double Compartment Fireless

Another type of fireless brooder which came under my notice, and with which its maker, a Yorkshire poultry-keeper, was most successful, was a double-compartment affair for outdoor use; and the following is its description, as supplied to me by that correspondent—

This fireless brooder has proved very successful for rearing chickens. It is 4 ft. 6 in. long, 2 ft. 3 in. deep, outside measure, 2 ft. 2 in. high in front and 1 ft. 8 in. at the back. It has a double floor, with air space between; and the walls of the sleeping-chamber are also double, the inner wall consisting of a 1 in. board 9 in. deep. Three inches down from the top edge of this board two fillets are nailed on, about 14 in. long from back to front. On these fillets rests a tray having a coarse, open canvas bottom, and it is filled with light and dry wheat or oat chaff. An inner casing is made 1 in. less all round than the inside measure of the outer coop, and this space is packed with sawdust. Another tray is made to fit inside the coop and rest on the top edge of the inner casing. This also has a canvas bottom, and is filled with chaff. A flannel curtain is tacked on the front of the smaller or bottom tray, and slit into three or four pieces to allow the chicks to make their way under it into the sleeping-chamber, which will measure about 1 ft. 6 in. by 1 ft. 2 in., the remainder of the space (about 1 ft. 6 in. by 8 in.) being 9 in. high, and the sleeping compartment 6 in. high.

First of all, the coop is divided into two portions, the outer without a floor, to allow the chicks to get on the grass without going outside. The front of this portion has wire-netting panels of ½ in. mesh, and inside this are grooves for sliding in pieces of glass, which should be of such sizes that they can be put in to go half-way up, or the full height, according to the state of the weather. The entrance to the sleeping-chamber is 6 in. square, and fitted with a door-frame covered with small-mesh wire-netting. This gives a good inlet of fresh air, while the flannel curtain prevents a draught reaching the chicks. A row of holes (half a dozen) is bored in the top part of the front of the rearer to allow foul air to escape. The floor is covered with a good bed of litter. The chaff is removed from the bottom tray as soon as the chicks have got hardened off, while later it is taken from the top tray, leaving only the canvas bottom for protection. Later still, the tray is removed altogether, and, finally, the top tray. The most important point to observe in connexion with this fireless brooder is that the chickens' droppings must not be allowed to accumulate in the sleeping-chamber, but must be removed every morning. During fine days it is advisable to take out the trays, set them in the sun, raise the lid of the coop, and allow a good airing. I put three-week-old chickens into this at the beginning of March straight from a heated foster-mother, and they thrive well. No doubt newly-hatched chicks could be put direct into this brooder, setting it inside a shed or building where the temperature will be fairly even.

Outdoor Rearers and Indoor Hovers

The small unit system includes outdoor rearers and indoor hovers, the hover being in its own house; or several of them—each with a compartment to itself—may be located in a long brooder house with a passage way down the back. The single rearer is undoubtedly the most popular for poultry-keepers who work on a small scale, although I have seen the hover type in

use on more than one commercial poultry farm, where it is preferred to the up-to-date battery. The proper heating and ventilating of the sleeping chamber are problems which must be understood; hence it is most advisable to start the outdoor heated rearer a day or more before the chicks are due to arrive. Full instructions are given by the makers, and they should be studied. Test it thoroughly before a chick is put into it.

The temperature in this particular type of brooder should be about 80° F. when empty, as it will rise a few degrees when occupied. It should, however, be on the high rather than the low side, provided the chamber is properly ventilated. The place must be fresh; a rearer which gets filled with hot, vitiated air is injurious, and generally renders the birds subject to chill when they leave it. Such a temperature as that mentioned should be maintained for the first week, after which it can be gradually lowered, a degree or less daily, until by the end of a month it is not above 70° F. during the night. It is never advisable for the beginner to operate a rearer without a thermometer. Those who have been years at it are able to ascertain the heat of the apartment by applying a hand inside the chamber; but the novice should depend on a good thermometer.

Outdoor brooders are made with day and night sections, the latter generally being heated from a centre lamp, and the former having a wooden floor; and both of them should be kept littered, since it is detrimental to force chickens to sleep or stand about on plain boards. When in use, even in winter, the rearer is supposed to be outside; that is, there should be no necessity to run it in a shed. Hence, its position should be similar to that which I advocate for the double coop with the hen—sheltered from winds, and in a dry place. To operate it successfully requires supervision; but the novice must not imagine that this amounts to being always on the spot to raise or lower the heat according to each puff of wind. If that were so, then most of us would leave artificial rearing severely alone and depend on hens. All that is necessary, however, is to keep a steady temperature in the heated section and arrange that the chickens can leave it and return when they feel so disposed. These rearers differ in size, and there is no standard pattern; but for 100 chicks ample room will be provided in one measuring 7 ft. 6 in. long, 2 ft. 9 in. wide, 2 ft. high in front and 1 ft. 9 in. at the back, the warm chamber being 2 ft. 6 in. square, inside floor space.

Suitable Accommodation

Some authorities consider this accommodation is more than sufficient; but it allows plenty of breathing space for the chickens until they are old enough to thrive without artificial heat. The great thing throughout is to avoid overcrowding the birds. Such a rearer as I have just mentioned should provide ample accommodation for chickens as long as they require brooding; it averages 1 sq. ft. for every five. When they are being reared solely in a house, they will require floor space at the rate of 8 sq. ft. for every dozen up to six weeks of age, and twice that amount from six weeks onwards. This space must be in addition to that which is provided in the actual hover; and in these circumstances special care must be taken to keep the place clean, light, and well ventilated. During winter it is often advisable to provide them with warmth until they are eight or nine weeks old; but in this case a temperature of 60° F. will probably be high enough for them after the fifth or sixth week, and they should be gradually accustomed to do without it.

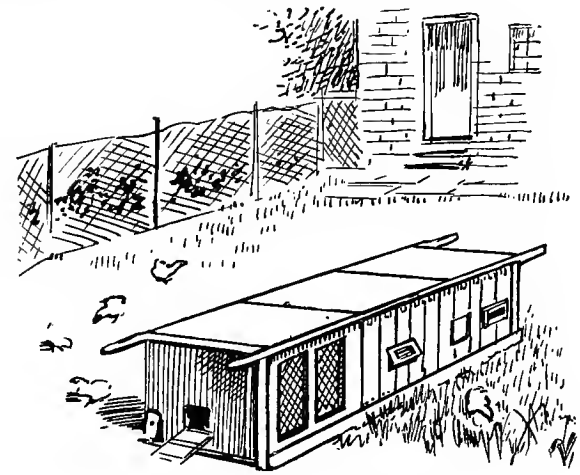


FIG. 112. ARTIFICIAL REARING
The back lawn makes an excellent place for the artificial rearer

There is no need to be unduly fussy about the birds, although at first close attention must be paid to them. They should get accustomed to run in and out from the warm chamber; and if, when out, they appear lost, they must be shown the way in. It requires plenty of patience. I have heard of users of outdoor rearers converting these appliances into weaning houses when the heat is dispensed with; but I prefer to transfer the birds, after they are hardened off, direct from the brooder to the rearing houses in which they can perch, and particularly into Sussex night arks, placing sacks or long straw over the slatted floor for the first few days if the weather is inclined to be chilly. The earlier the chickens are allowed to perch the less likelihood is there of trouble from overcrowding. There are poultry-keepers who imagine that early perching results in crooked breastbones;

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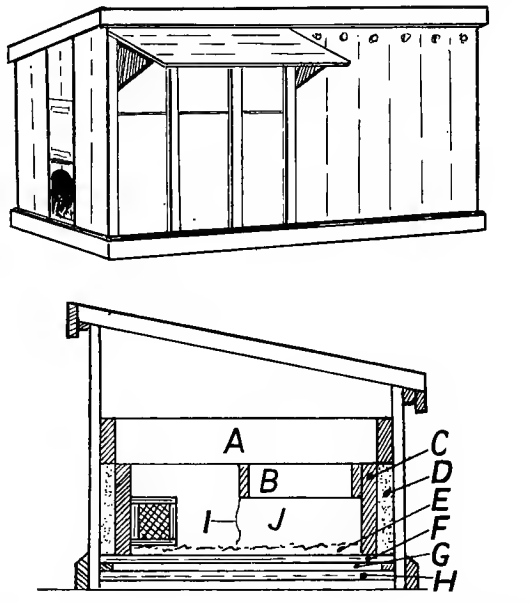

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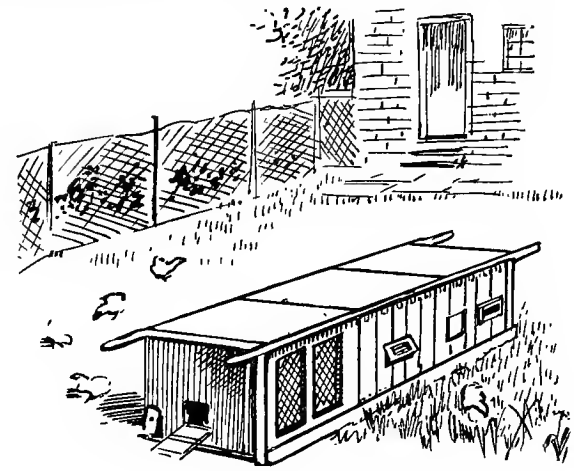

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but this is not so, if the birds are sturdy from the shell, and are properly managed. Perching permits of their sleeping in the air; and that is always beneficial, provided the perches are out of draughts.

The Hover Type

The hover type of rearer, either canopy, cone or pyramid style, no matter by what name it is called, is simply the heater, a single compartment appliance which can be put into almost any building, poultry house, or fowl cabin. This kind of rearer is made to all shapes and sizes; some are square and on four legs, others round and supported only by the compartment containing the lamp; some have flannel surrounds, slit at intervals, and others are entirely enclosed, while there are those made of wood and others of metal. As a rule, their limit is fifty chicks, but there are some which accommodate twice or thrice that number. They are intended for poultry-keepers who rear chickens on a small scale. During my peregrinations I have seen a dozen to a score of hover cabins on one place, each with as many as 100 chicks; but probably few poultry-farmers nowadays would adopt such a method for rearing in a large way. And yet, at a recent Surrey Poultry Conference, one of the speakers remarked—

> Ten years ago I brooded chickens in lots of seventy-five to one hundred under hovers in small houses from which they had access to fresh grass runs; and that, I am convinced, is still the best system of raising chickens of stamina. Under this arrangement the chickens experience heat and cold alternatively and get an abundance of fresh air as Nature intended they should. This promotes good circulation and a healthy blood-stream, a well-nourished nervous system, and an ability to assimilate food.

In rearing chickens the object is to give them favourable conditions which will provide all the essentials of life and growth, and also the natural hardness which will make the stock vigorous. The hover type of brooder is claimed to be an imitation hen, providing artificially only the heat, but covering its chicks, on a solid, littered floor, in conditions otherwise more or less natural; and the strong point of this system is said to be its nearness to Nature. I have operated hovers, and they are simple to manage up to a point, but they are by no means fool-proof. Whenever they have to be inspected the whole top has to be removed; and this, even up to the last day on which it is necessary to use them, is apt to cause undue excitement among the chickens, as also does the replacing of the cover. Unless the attendant gets down on his knees it is impossible to see the birds until the top is taken off. Moreover, the chicks being at large, one has to be especially careful on the feet—they sometimes prevent one moving. However, these are perhaps minor matters; and maybe it is that I am clumsy.

That sound chickens can be reared in them I know well enough, because I have been successful with

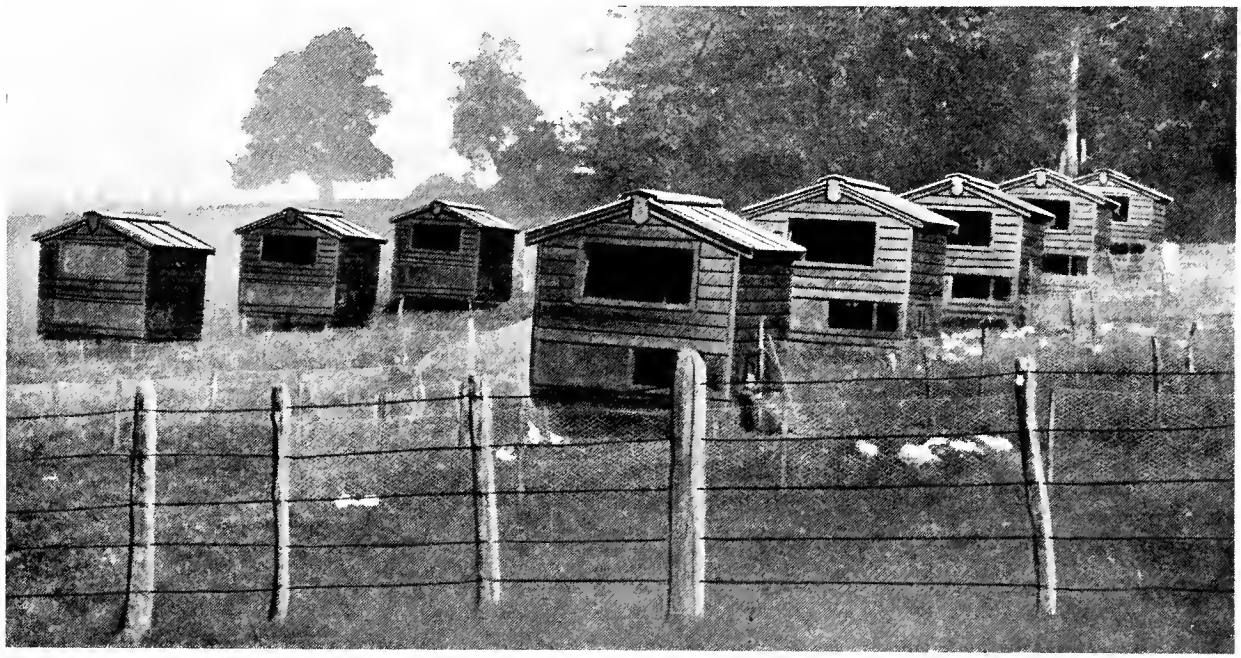


FIG. 113. ARTIFICIAL REARING—SMALL-UNIT BROODER HOUSES

hovers. The regulation of the temperature is similar to that which I advocate for outdoor rearers, but it should be about 90° F. at first, the temperature being taken just under the hover and 2 in. from the floor. Keep it on the high rather than the low side. Beginners are often alarmed if the temperature rises beyond what is generally set out as a maximum, viz. 90° F. But there is no occasion for alarm at even a considerable rise of temperature in a hover, always provided the chickens can get out of the actual heat, if necessary. Trouble will be experienced only if the birds are so confined that they cannot find a cool zone; and the usual temperatures which are given apply solely to the enclosed brooder. All ideas of overheating can be safely dismissed if the chickens can have access to warm and cool zones at will, because the birds will not stay where they are uncomfortably hot if they can get away. Overheating admittedly means using more oil than is absolutely necessary; but rather that, provided the birds can get away from it, than chickens being brooded at a temperature which chills them. I feel sure that many cases of so-called bacillary white diarrhoea are due simply and solely to insufficient heat rather than to the actual disease; that is, the symptoms which so many poultry-keepers are apt to mistake for bacillary white diarrhoea are often those of "stomach" trouble set up by chill.

To revert to the hover, however, while it is necessary that the chicks be permitted to move out of the heat zone when they like, it is essential at first to prevent their straying too far away. Anyone who has used an open hover—and by this I mean one surrounded by hanging flannel, and not the entirely closed type of wood or metal—must have observed that in their early days some chickens which leave the warmth seem to lose their sense of direction and fail to return to the heat, crowding outside the circle and standing a good chance of getting chilled. Only this past season, when hover-rearing some chicks in an outhouse, I had such a case, but was very fortunate to observe it before damage had been done. During the first three or four days after the birds are put under the hover, therefore, it should be surrounded by a 6-in. high screen of 1 in. mesh wire-netting or wire-gauze, about 1 ft. from the curtain, so as to prevent any chickens straying beyond the radius of the heat. They generally soon learn to return, although it may be necessary when on the night round to put a few under cover, as there are those which appear to be somewhat slow-witted in their baby stage. Hence it is why one must always be extra careful and attentive when artificially rearing chickens, especially during their early days. They must get accustomed to returning to the heat; so see that they are put in, and do not let them huddle around outside looking utterly dejected.

Varying the Temperature

The behaviour of the chickens themselves will generally be the best indication of whether the temperature is correct or not. If more heat is required they will crowd in as closely as possible under the hover and keep there during the greater part of the day, missing most of their food, whereas if they seek its shelter only after feeding and taking exercise, and spread comfortably out while resting, it is a sign that all is well. When using hovers I operate three or four in an outhouse, sectioning the broods by 2 ft. high wooden partitions, and keeping the room temperature as near as possible to 60° F. in winter. This makes it an easy matter to regulate the temperature of the brooders; and, moreover, it encourages the chickens to keep on the move between the food and water troughs and their artificial mother. When they have settled down for the night they should spread out around the edge of the hover, and not huddle against the heater. If this latter occur, or should they be

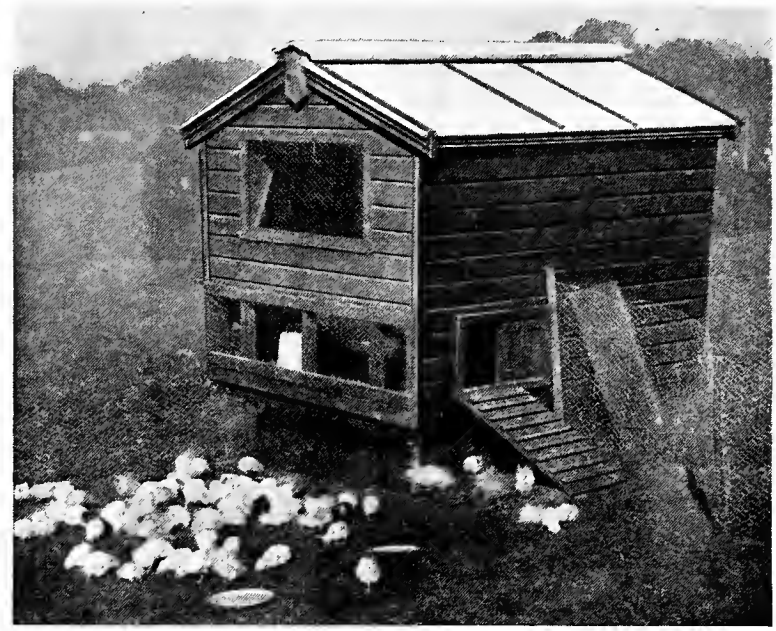


FIG. 114. ARTIFICIAL REARING
A "close up" of a small-unit brooder house. Note the wide ladder, and the wire-netting around the house to prevent chickens getting beneath it

observed crowding to one part of it, then either the heat is insufficient or the chickens are trying to get out of a draught. As in incubation so in rearing, ground draughts must be avoided, in the earliest

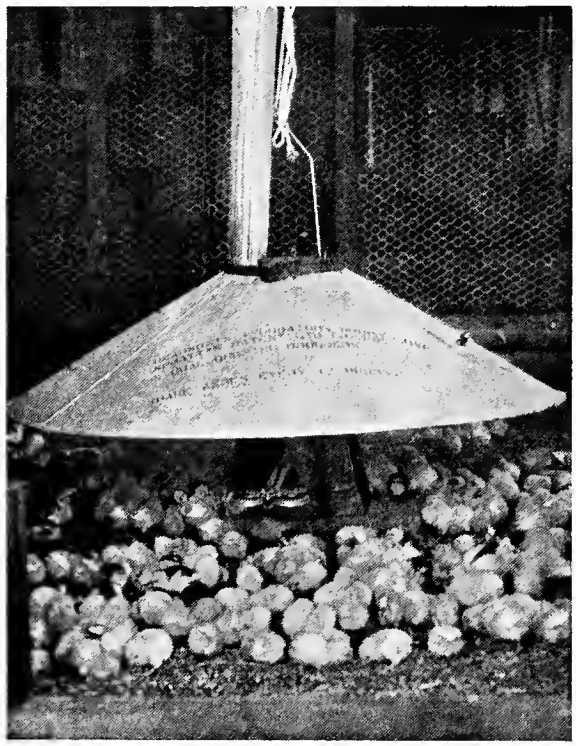


FIG. 115. A HOVER, WITH CHICKS JUST TRANSFERRED FROM THE INCUBATOR

Hovers of this type are located in a brooder house. They include the Coal Stove Colony, for broods of 150 to 750—the hover varying from 3ft. 6 in. to 4 ft. 8 in. in diameter—the Blue Flame Oil Burning Hover, for 50 to 350 chicks, and the Electric, for broods of almost any size

stages at any rate. It is not a difficult matter to ensure freedom from draughts by means of a screen; and the partitions mentioned above act well in that direction, since they prevent draughts but ensure regular air movement.

It is a most important point to see that the air under the hover is not stuffy; hence, while the atmosphere of the house itself may strike one as being correct as regards its freshness, it is always advisable to ensure that such a condition prevails where the chickens sleep. For this reason the hover itself must be properly ventilated, and especially at night. Usually far less air circulates under the hover than in the house itself, so that the ventilators should be more open at night when all the chicks are resting there than in the daytime when most of them will be outside the hover. It is a mistake to close the ventilators at night with the idea of providing enough warmth for the birds; but, of course, they must be warm.

Those of us who rear chickens are well aware that overcrowding must be rigorously guarded against. And yet, chickens in all stages of growth are apt to crowd together while they are sleeping. I have seen them do so in the ark; and they certainly huddle together when roosting on the usual perches. However, the mistake is made in judging the capacity of the brooder from the day-old stage rather than at the hardening-off period. For some reason best known to themselves, many manufacturers of these appliances over-estimate the capacity of their machines; at any rate they estimate it at the commencement of rearing and appear to be oblivious of the fact that chickens do grow. Hence it very often happens that if 100 day-old chicks are put into a so-called 100-chick brooder that number will have to be halved by the time the birds are about a month old—frequently earlier than that with vigorous chickens. There is, however, this point in favour of the open hover; the curtains can be partially opened, and eventually taken away, before it is necessary to separate the chickens from artificial heat. With the closed-in rearer, nevertheless, I always estimate an advertised 100 size as suitable for just half that number.

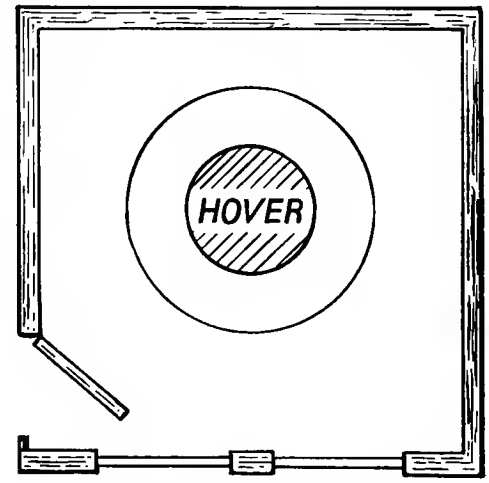


FIG. 116. THE HOVER GUARD

To confine chicks to a definite heat zone for the first few days in the brooder house, it is a good plan to place a guard around the hover, allowing 2 ft. to 3 ft. between them. The guard can be made of 1 ft. wide strips of three-ply wood or stout linoleum. The opening of it should face the front of the brooder house

Attending to the Lamps

When the space is very limited the smaller chicks will invariably get crushed. There is no sense in forcing the youngsters to pack together like tinned sardines. See that they are allowed breathing space, which they will get if given room in which they can

spread to sleep, and the rearer is properly ventilated. Even with the smallest flame possible the body heat generated by sturdy chickens of two to three weeks old will send the temperature up several degrees. It has been said that oil-lamp brooders are difficult to ventilate properly, while the fumes from the oil are dangerous. This may be so, and yet it will not be so if the lamps are seen to and the best oil is used. Attending to the lamps is a matter of some importance in artificial rearing, because, in winter particularly, it is essential that a correct temperature be maintained. The wicks must be kept trimmed as scrupulously as when oil is used for incubation; the flame must be bright and even, and without any spikes. Specially prepared wicks can be obtained for most kinds of oil lamps which are used in artificial incubation and rearing; but if the usual wicks are being burnt, care must be taken to see that they are kept clean and, moreover, renewed before they, by being regularly trimmed, get too short to reach the oil.

The whole wick should be examined at least once a week to ensure that it is free of foreign matter and that it permits of a correct flow of oil, while, if necessary, the top of it should be trimmed level and the ends rounded with scissors made specially for the purpose. It is always beneficial to have a supply of wicks on hand; and it is worth while also to have an extra lamp or two. These little matters are very apt to get overlooked by anyone who is not accustomed to wick-burning oil lamps. But if, by neglect, a wick should smoulder down and peter out at some time during the night, and that night be in winter, the temperature will drop to such an extent that, by the morning, the result cannot be less than chilled chicks, although as a rule it means a much worse disaster in the very early stages of rearing. Similar trouble will be encountered, of course, if the outdoor brooder be located in a place at all exposed to winds, because there is every possibility of the flame being blown out in a gale. Substantially made as most of these appliances must be to remain standing during high winds, it is seldom that the lamp can be kept burning steadily at such times. Hence, if they must be operated out of doors throughout winter they should certainly be adequately protected. Much better to rig up some kind of rough shelter for them.

Rearing on a Large Scale

Now that the keeping of poultry has been commercialized and put on a thoroughly business basis, the aim is, as it must be to make the undertaking a financial success, to keep running costs down to the very minimum consistent with good results. With this object in view, therefore, everything connected with it is handled on a large scale; and this applies to hatching and rearing as well as to the running of the adult stock. The system of brooding must be such as will enable the worker to cope adequately with chicks hatched by mammoth incubators. Hence, while the appliances with which I have just dealt are very suitable for poultry-keepers who rear their chickens artificially on a modest scale, it must be obvious that, on account of their size, either of those systems would be practically unworkable when chicks must be raised by the thousand at the least cost of time and labour. For this reason operations are conducted on a large and concentrated scale; the method adopted must be such as to keep labour to the minimum. Consequently, until the chickens are off brooder heat—which may mean up to nine or ten weeks old in winter—they are kept on a more or less intensive system. It is to this form of rearing—large numbers in a small space—that some authorities have been led to imagine most of the present chicken troubles are due; but while bad rearing does very considerably interfere with stamina, there is really no justification for it. And it is the man in charge rather than the particular system who is to blame for poor results.

At any rate, when rearing is being carried out on what I have frequently termed "mass production" lines, it is more than ever necessary for the attendant to know his work. Most of the trouble in artificial rearing is due to lack of knowledge. Rarely nowadays is it the result of faulty brooders, because the large-scale system has passed out of its experimental stage; and these appliances are made with as much care as incubators. What the worker of the artificial rearer must bear in mind, no matter which system he adopts, is that the brooder is merely the heater; the very best rearer which is made can do no more than provide warmth. It has not the instincts of the clucking hen; and the operator must therefore exercise particular care when dealing with the chickens.

It is because of this that large-scale rearing should not be entrusted to those who are lacking in common sense. The very largest hover, capable of warming a thousand chicks at a time, can be successfully worked when it is understood; but it is folly to imagine that anyone accustomed merely to handling hens and their small broods can start right away and meet with success at rearing on a large scale. Considerable experience with artificial rearers is necessary before one should attempt to deal with thousands of chickens at a time. It is not a matter of the system being unworkable; it means understanding it, and being accustomed to handling hundreds instead of tens, while intensive rearing demands greater skill in management.

A Suitable Building

One of the first essentials in connexion with large flock rearing is a suitable building in which to locate the heaters; because to such an extent must the birds be reared intensively at all seasons, that they should be kept indoors during their early stages, and, in some cases, until artificial heat has been entirely dispensed with and they are cooled off. The buildings will vary according to the system that is being adopted; but the essentials for them are sound construction, thorough ventilation without undue draught, and dryness, which means no fear of the walls "sweating" or condensing the atmosphere to such an extent as to soak the place. Admittedly, there may be occasions on which a certain amount of internal damp cannot be avoided; but adequate ventilation will keep it to the minimum. Although it may be true that chickens which are brooded naturally thrive better in a damp warm season than during an abnormally dry one, I have yet to find that those reared artificially require an artificially humid atmosphere. It may also be true that, as one authority recently remarked, "no one really knows what is the best humidity for young chicks, and the matter requires experimental investigation." As a practical worker, however, I maintain that, granted ample air space and proper room ventilation, sufficient humidity is obtained from the atmosphere and the water in the drinking vessels; and even when the birds are being reared on the battery system, it is not absolutely necessary to swill the floor of the room. One of the best methods of keeping the air fresh is that which I have described in the previous chapter, when dealing with artificial incubation, although ridge ventilation could take the place of the Louvre box.

Fresh air must be available at all times, but the chickens must not be unduly exposed to draughts of cold air. On the other hand, a very still atmosphere generally means a stuffy one, that is, foul air. Chickens must have oxygen to breathe; consequently there must be plenty of fresh air in the house in which they are brooded. If it were not necessary to keep them warm and out of draughts, it would be a simple matter to provide them with all the fresh air they could possibly require. But since warmth is essential when they are not being brooded by a hen, then we must see that they get it. After all, it is not a difficult matter to keep the warmth up and yet give the chickens an adequate supply of fresh air; but while, obviously, the method of ventilation must be dependent upon the way in which the birds are brooded, it is surprising that so many losses in artificial brooding are due to lack of fresh air. As long as they are kept warm, and draughts are excluded, the house can scarcely be over-ventilated. In this respect it is safe to say that a temperature which suits a normally healthy person in a living room is sufficient for chickens in a brooder house, always provided the air under the hover itself is fresh. If the atmosphere

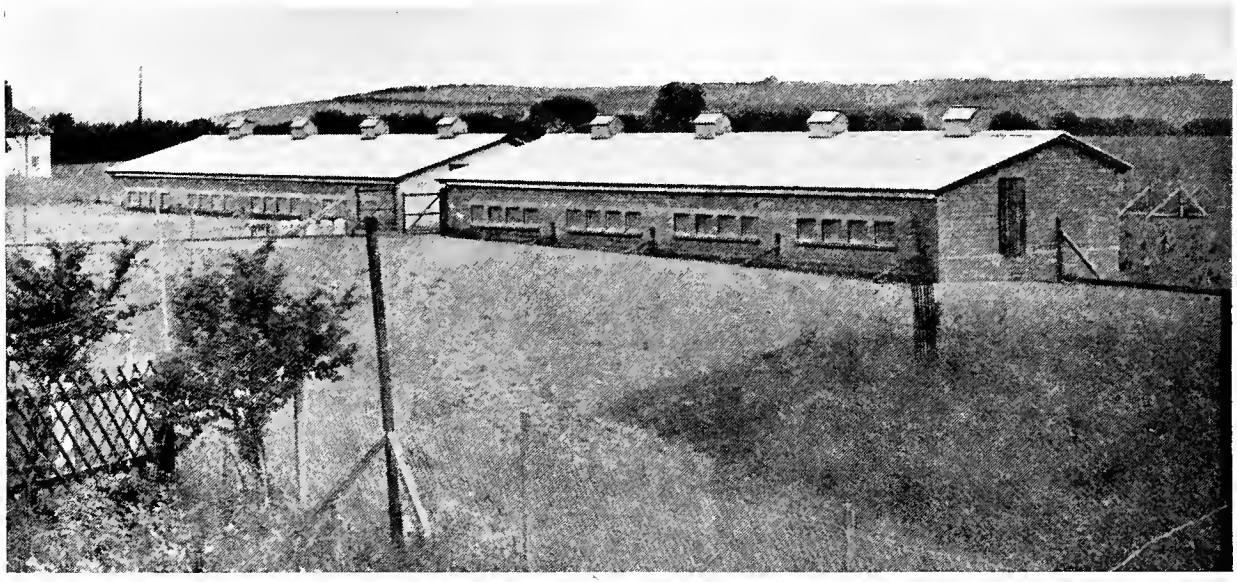


FIG. 117. MAMMOTH BROODER HOUSES

These houses are brick built and roofed with corrugated iron sheets. Each of them could be sectioned for ground rearing to accommodate 1000 chicks or utilized for battery brooders or mammoth incubators. They would also make excellent quarters for layers which were being kept on the semi-intensive system. Note the ventilators in the roof, to ensure correct temperature of the interior

of the brooder house is stuffy, then more ventilation is required.

Various Systems of Ground Rearing

In the matter of buildings there are two distinct ways of rearing, namely, on the ground and in batteries. Ground rearing on a large scale has been in vogue for many years; and brooding large numbers of chickens on solid floors is the usual practice to-day. Only of very recent times have batteries come into use. The strong point about brooder house rearing is that it is relatively as near to Nature as artificial rearing can be adapted in the matter of accommodation, because, of course, chickens with hens are brought up that way—on the ground. In this direction, then, various kinds of appliances can be utilized as the heating arrangement. Perhaps the first attempt during comparatively recent years at rearing in large numbers was by the hot-water radiator system, which is still in vogue at some farms. It is said that this type of brooder is bound to become more popular than it is at present; but I question whether it will be so, if merely because to install it involves a large capital outlay, and it does not tend to keep labour charges to the minimum. For its accommodation the usual large brooder house is necessary, and much ground has to be covered, while numerous small runs and fences have to be provided.

Some of these buildings have a passage way running along the back, with 5 ft. wide compartments in front, while in others there is a central gangway with the sleeping compartments on both sides. Flow and return pipes run the whole length of the brooder house; and the pipes are so fixed and boxed that chicks cannot get on them. In some of them the floor is movable to allow of the growth of the birds, while in others the pipes gradually rise and the bedding is so contrived that in each compartment it is within three inches of the pipes. A board on top of the pipes keeps the heat on the chicks, while a sack is generally put on the board during the first week for extra protection, and at the end of a month the board is removed. Regulation of the temperature is a somewhat difficult matter, while ventilation often gives rise to anxiety. Long experience has proved that 120 chickens are about the limit for each section, although some workers have succeeded with more. A similar kind of brooder house is used for hot-air rearing; and in this case, although it is divided in a similar way, each section contains an oil-lamp hover which is regulated independently, instead of the one stove providing heat for the whole house.

I have seen these systems in use at commercial poultry farms, and some of them were constructed on very elaborate lines. At one farm the house was worked on the latter plan; it was 600 ft. long, contained 120 compartments with their accompanying wick-burning oil-lamp hovers, and was capable of accommodating 15,000 chicks. I must admit that the hot-water radiator system is a labour saver in comparison, since only one stove has to be dealt with and, if the fire is properly made, it does not require a great deal of attention; but it can be imagined what labour was needed in attending the 120 lamps. In both of these systems it is essential to get the chickens accustomed to the heater before they are allowed free run of the section. They should be confined to the warm chamber for the first twenty-four to thirty hours after they are transferred from the incubator, and kept without food or water; but when let out they must be very carefully watched to see that all of them do find their way back to the warmth. Such attention is necessary, of course, when working with a single unit brooder; and in my opinion, a brooder house like this is decidedly more convenient than having many small cabins, each with its own hover, as previously mentioned.

The Colony Brooder Stove

Then followed the brooder stove, which was practically an elaboration of the hover method, and known as the colony brooder-stove system. Each stove, fitted out for oil (blue flame) or coal (anthracite), requires a double compartment house, specially constructed, one section containing the heater in the centre, and the other being used as the cooling-off room. In the stove section there should be about 1 sq. ft. of floor space for every three chickens up to three weeks; and a 12-ft. by 10-ft. house will be large enough in which to run a blue-flame hover for some 300 chicks. When introduced, about 1918, it was undoubtedly the greatest advance in artificial brooding on a large scale which had been made. The birds spread out around the stove, getting near when they require heating up, and receding when the heat becomes intolerable. The advantage claimed for it is that, nothing being directly around the heater, the chickens have full circulation of air around them, and thus they do not pack too closely, the inner circle being some eighteen inches from the stove, as the heat rays hold them back. As many as 1500 chicks have been brooded in one of these houses, but the maximum appears to be about 500; and, like some other hovers, it is safe to say that the limit for a 500 size would be 300.

No doubt vast improvements have been made in recent years. When these appliances were first introduced from America it was found to be impossible to maintain the evenness of temperature essential to the successful rearing of chicks throughout the

twenty-four hours, unless a man was in attendance at night to shake down the stoves and coal when necessary, because owing to the draught in connexion with the burning of anthracite depending upon atmospheric conditions, it was not unusual to find on a frosty night the fire roaring away, sending the temperature up to about 110° F. in the centre of the hover, and within three hours this would drop to less than 90° F. And as it is impossible to avoid ground draughts where the heat is for a period so fierce (as naturally the higher the heat the greater the attraction to the cold air) many of the chicks were chilled, and the assimilation of their food was arrested as a result. It was then found, although the stoves were running in brick-built houses, that the galvanized chimneys supplied with them were unsatisfactory as there was much condensation, as the result of the humidity of our atmosphere. This meant the provision of brick chimneys, which was carried out; but even then, chickens could not be reared with a sufficiently small percentage of losses to make this practicable. However, there are now installations which furnish a sufficiently high temperature to enable the chickens to digest their food, for it is on this that success depends. But great care has to be exercised when the colony brooder stove is in use, and it is certainly not the type which a novice should attempt to work.

A still further advance was made, in this country at any rate, in the large flock system of ground rearing; and, while hot water was the medium, it was on a much more simple plan than the pipe method mentioned above, although the heat was obtained from one boiler and an anthracite burning stove, the latter being confined to a compartment at the end of the brooder house. In one of these installations I inspected, the heater for each sectional run inside the house was a fixed radiator of four legs with an adequately ventilated and movable hover well above the chickens, so that the whole floor space was at their disposal. This system was comprised of several units, each accommodating 250 chicks; and as each unit was separately controlled, any number could be used at one time. In addition to this, the heat could be regulated according to special requirements, irrespective of the varying ages of the birds which might be in the different sections at the same time. An even temperature could be maintained night and day, without in any way affecting the ground under the radiators. There was an absence of fumes in the brooder house, while, as the heat was evenly distributed, there was no undue crowding of the chickens at any period. However, the reduced overhead charges which were expected and required to result from this system were unfortunately not realized, and although strong chickens were reared in good numbers, the end did not justify the means.

Outdoor Exercise

There are, no doubt, other types of appliances suitable for ground rearing; but so far as I have seen, each involves the use of a considerable floor space. This, admittedly, is not a disadvantage in the sense that it enables the chickens to exercise their limbs in congenial surroundings and, during the roughest days in winter, to get plenty of sunlight and fresh air. The idea of ground rearing, as can be imagined, is to permit of the birds getting a run out of doors. But although the weather may appear to be suitable, it is very questionable if anything is to be gained by allowing baby chicks to explore outside in winter. It must be remembered that winter is not the natural rearing season; hence, to let them wander around when the land is frosted and cold or soaked with rain, because it is the nature of chickens to grub about and exercise their limbs, is, obviously, not beneficial. Even when the outside range system is adopted, there are many days throughout winter and spring when it would be the height of folly to liberate the birds at all; and, in these circumstances, I strongly recommend intensive or indoor rearing for the first three weeks, because it very materially reduces the danger of chills, to which baby chicks are susceptible.

It is thought that long confinement to a brooder house is dangerous; and so it is, but only if the attendant pays little attention to the litter and neglects to ventilate the place in such a way that fresh air is assured. It must be admitted that one of the greatest difficulties in connexion with ground rearing, when large numbers of chickens are kept together, is to prevent their droppings becoming a menace to their health. When a small clutch of chickens is in charge of a hen, the excrement in the coop each morning is considerable, although the birds have been confined to their sleeping quarters for only a few hours from the previous evening. In this case, of course, the daily removal of the excrement can be quickly effected; but when a single brood consists of several hundred chickens it becomes a difficult matter. To maintain absolute cleanliness in these circumstances, therefore, involves constant cleaning out and much use of litter and labour; and brooding large numbers of chickens on solid floors, as in ground rearing, makes perfect organization no easy task. It is on account of this that wire floors have come so much into vogue of recent times, of which more anon.

Attention to Details Necessary

Two or three items in connexion with brooder houses must be noted. Many an operator fails to get

the best results because of inattention to details, the little things that matter. To be successful at rearing chickens in large flocks means that not one item must be overlooked. When lamps are used for supplying the heat, there will be trouble if care is not taken to burn the best oil only, and to see that the container and the wick are kept clean, and the latter well trimmed. The attendant must be careful to prevent it from smoking and also to adjust the wick to get the best heat with the least consumption of oil. If a coal-burning stove is in use, the operator must know how to stoke and clear it, and how to bank the fire to last through the night—if properly made it should last for twelve hours without attention and keep the water at the right temperature for the youngest chicks. The thing to avoid is having to let it die out in order to get the clinkers away, or allowing it to get so low that feeding it will lead to an explosion. No matter what type of stove is used, the maker's instructions should be closely followed at first; experience will show what adjustment, if any, is necessary for particular circumstances. The brooder house should always be warmed up for a day or more before the chicks are due to hatch, while, if an entirely new system is being used, it is most advisable to give it a week's trial, so that everything can be adjusted to ensure perfect running and an even temperature. This will not be a waste of time and labour, as it will enable the worker to get thoroughly accustomed to it.

When the chicks are completely dry and ready to be transferred from the incubator room to the brooder house, they should be very carefully packed in the ordinary chick-travelling boxes, although almost any kind of shallow box with a lid will be suitable for the purpose, if it be well lined with fresh hay. No matter what the distance between the two places, every precaution must be taken against the chicks getting chilled while being so transferred, because chicks are never more susceptible to chilling than they are immediately after being hatched. The whole process cannot be made too expeditiously; while if it can be carried out in the evening so much the better, as the birds can then be left to settle down until the morning. Too frequently this matter is overlooked by the beginner; but chilling of this kind almost invariably leads to considerable mortality during the first two or three days of rearing. It is as well to remember also, unless a blue flame hover is being used, to put the chicks right under the hover and to keep them confined to it for some hours; and, for the first three or four days after they are released, to see that all of them can find their way back to the warmth.

The attendant must exercise patience in accustoming the birds to the unnaturalness of the brooder, if he wish to raise every rearable chick. It never comes amiss to use a guard at nights, as I suggest in connexion with the single unit rearer. These little attentions, tedious though they may appear to be to those who have never handled chicks in artificial rearers, make all the difference between success and failure. As to the temperature, work the heater as previously advised. The aim should be to give the chicks sufficient warmth to keep them comfortable. It is a bad sign when they spend most of the day in the hover, as it generally indicates too low a temperature.

Protect Chicks Against Chills

Now with regard to allowing the chicks to explore outside, it is, of course, a mistake to attempt rearing chickens for stock—and that includes egg production—as though they were hot-house plants. It is certainly advisable to let them get accustomed to fresh air almost from the beginning; but, during the early part of the year it is the height of folly to force them outside to do so. What some people fail to recognize is that winter is not the natural chicken season. I have never yet heard of a hen bringing off a brood of chicks in a hedge bottom at that time of the year. Much is being said these days about getting back to Nature in the rearing of poultry, that is, letting them rough it. But, while this may answer well enough from mid-spring onwards, it is most unwise to attempt such methods with the earliest broods in their tender stages. I do not believe in coddling chickens. Nevertheless, if we must rear them artificially long before their season—as we must, nowadays, when engaging in the business on commercial lines—then we must endeavour to provide them with as genial an atmosphere as they would get in the open during spring. Allowing them to experience heat and cold alternately is a fine idea; but a difference between brooder heat and winter blast is too great to be safe. Moreover, baby chicks are not made to stand such treatment.

One has only to examine a chick to ascertain that it has ample protection on all parts of its body excepting the lower region and sides of the abdomen. The heart, lungs and organs of respiration are protected by the breast bone and a covering of muscular tissue; but the organs of digestion are, with the exception of the thin exterior membrane, absolutely unprotected. Therefore, when a chick is exposed to cold, the abdominal organs are the ones which suffer. The chill, striking through the membrane, attacks the intestines and retards the circulation of the blood. Thus the intestines, being deprived of the agent necessary for the exercise of their natural functions, are unable to perform their duties. The foodstuff in the bowels accumulates and decomposes, thus

giving rise to irritation, which inflames the bowels, and invariably ends in death. Hence the necessity for protecting them from chills. They will get a good start in life if, in the early rearing season, they are not allowed to run outside until they are at least three weeks old, while if they can be kept in for longer, so much the better if the weather is rough.

A Temporary Enclosure

It is most unwise, therefore, to force chickens out of doors during frosty or wet weather; in fact, on the most congenial of days when they are ready to face the world they should not be driven or coaxed out—just give them the opportunity of getting there, and they will in time wander out of their own free will, if the weather is fine. When they are first outside the brooder house see that they cannot get far enough away from it to become lost. Some chicks have no sense of direction; and many a one would perish, even when with a hen, if it were not for the mother bird's cluck. So, since the hen call is absent from artificial rearing, I find it very beneficial to fence off, temporarily, a small portion of the outside run until the chickens have learnt their way back to the brooder. A roll of 1½ ft. or 2 ft. high 1 in. mesh wire-netting will be ample for quite a large number; and it can be set up in a very few minutes, because, as a rule, the rigidity of this small mesh netting requires the use of very few pegs to keep it in place.

Two precautions must be noted; the first is to see that the space temporarily wired off allows the chicks room to spread around and not merely to crowd together outside the trap-door; and the second, to block up any hollows there may be under the wire fence. Most confined fowls try to break bounds; chickens will do so almost from the day they are hatched—perhaps because it is natural for them to use force to get out of their shells. As it is, they will break out of their run if there is the least opportunity of their doing so; but rarely will they use the same opening for returning to it. Hence, see that any hollows are filled rather than cut the ridges to take the wire-netting. It is a temporary run; and the "fence" will be required for many years' use during the rearing season.

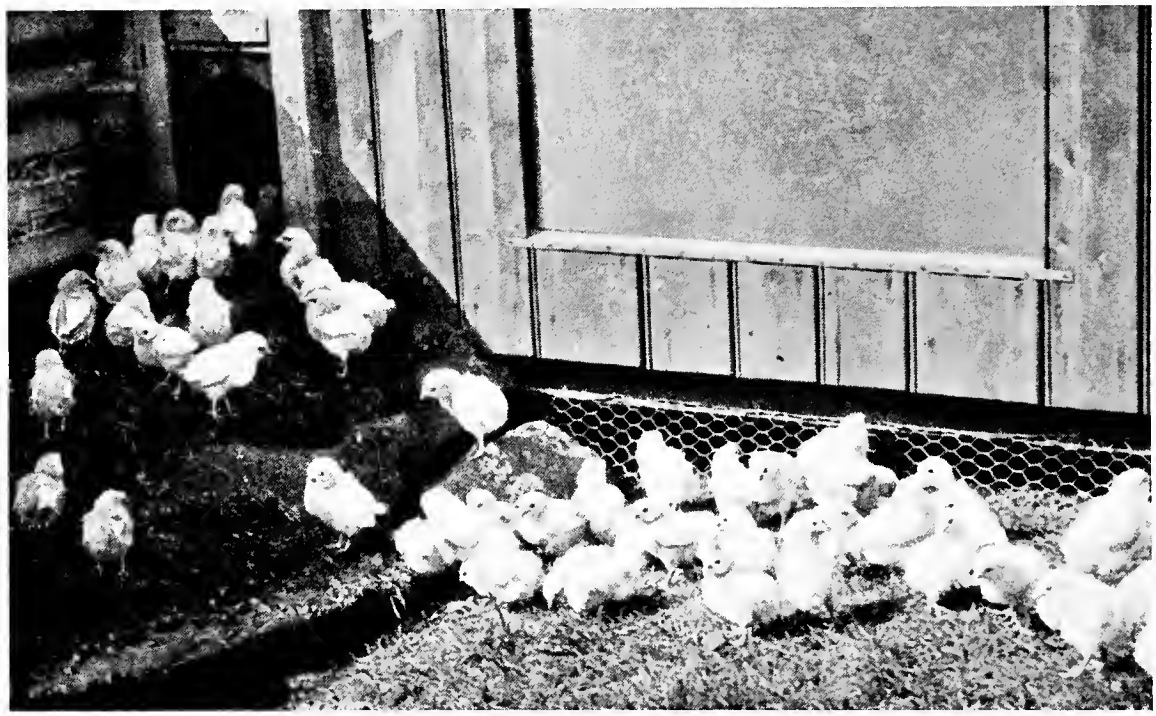


FIG. 118. THEIR FIRST OUTING

White Leghorn chickens taking their first day's look at the outside world. Note the wire-netting at the bottom of the artificial rearer to prevent the birds getting under the floor. Although intensive rearing is much in vogue these days, many poultry-keepers find it beneficial to let their chickens range about outside in fine weather

There are other details which count in brooder house management—minor, mayhap, but nevertheless important. Crowding seems to be one of Nature's gifts. And chickens never hesitate to bunch together if they get the chance. It is very apt to cause trouble during artificial rearing. Sometimes the birds take it into their heads to crowd into corners of the brooder

house. To obviate this some rearers use round, and others hexagonal, heptagonal, and octangular houses, all of which I have seen in operation; but since the square or oblong building is much more convenient, despite what may be claimed for the others as sun traps, care should be taken to round off any corners with wire-netting. Thus, when the birds collect closely and promiscuously together, there will be plenty of air and very much less chance of some of them being stifled or crushed. Then there is the question of egress when the chickens have to be allowed outside. This necessitates a trap-door; and it should be large enough, at any rate sufficiently wide, to permit of at least a score passing out at a time. The trap-door which, by its narrowness, forces them to squeeze through, is indeed a trap, a veritable death-trap generally; and yet many brooder houses are so fitted. Much better open up the whole front at the bottom than use the narrow openings some houses possess.

Then, too, protect the opening in such a way that rain cannot drive through it and soak the floor. It is a very simple matter to rig up some kind of hood, or to hinge the trap-door at the top and swing it outwards; but in this latter case so fix it that it cannot be blown about, since a flapping door is very apt to make the birds unduly nervous. Moreover, because most chickens in their early stages seem to have a rooted objection to travelling uphill to get out of a building, the trap-door should be on the ground level whenever possible. If this cannot be arranged, however, let the approaches to it, both inside and outside, be in the form of a very wide and gently sloping ladder, made of solid wood with narrow strips nailed across it, horizontally, every inch or so, to act as footholds. These ladders should be much wider than the openings, because chickens do not leave the brooder house in single file; and when they return to it by a gangway, they generally like to bide a while at the top, as if the climb had been too much for them. This hesitation immediately to enter a house is noticeable even in the growing stage, when young fowls will often roost in the doorway of a Sussex ark.

However, another detail of the brooder house concerns the light. Some authorities advocate a veritable glass-house for the artificial rearing of chickens; but sunlight can very easily be overdone. One of my friends had his brooder house fitted with blinds, to enable the birds to settle down of an evening before dark; but that was as unnecessary as the all-sunshine idea. These, in my opinion, are extremes. By all means avoid dark houses, but if the sun is too strong tone it down by the use of frosted or white-washed glass. In many lamp brooders the light is fully exposed all through the night; but chicks are not adversely affected by it. They will sleep soundly during the day when the sun is brilliantly shining.

Solid *versus* Open Floors

As I have remarked when dealing with the rearing of chickens on a large scale, it becomes a difficult matter to maintain absolute cleanliness and to ensure perfect sanitation when hundreds of birds are being brought up intensively, i.e. indoors, on a solid floor. There are authorities who say that when large numbers are so spread out, one layer deep, proper sanitation is impossible, and that such conditions are definitely unhygienic. I should certainly not go so far as that because, even though it may be so from a scientific

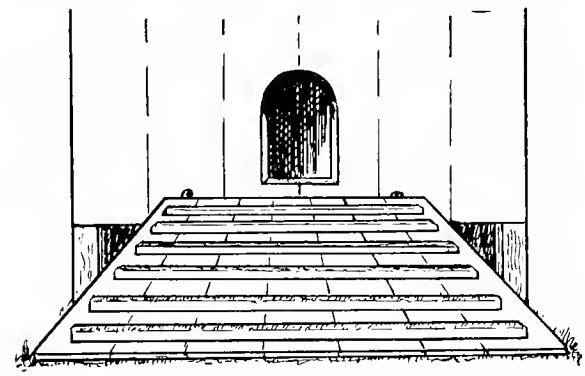


FIG. 119. A CHICKEN LADDER

Ladders to enable chickens to leave or enter their house—when such are necessary, as in the case of arks—should be at least three times as wide as the entrance or "pop" hole, and be long enough to ensure a gentle slope

point of view, practical poultrymen know well enough, from the results they obtain, that sanitation and hygiene are very apt to be overrated in connexion with artificial rearing. Thousands of sturdy chickens have been, and will continue to be, reared on solid floors, either of earth, concrete, or wood; and proof of this is found in the rate of growth of such birds combined with the percentage of mortality, which compare most favourably with the recent system of wire floors, but always provided there is proper management. That is the crux of the matter, granted that the chicks, as they should be, are bred from sound stock.

Success will always be obtained as long as strict attention is paid to accommodation, cleanliness, ventilation, and feeding. These are the fundamental principles of artificial rearing. The first amounts to giving the birds room in which to grow; and under intensive rearing the floor space should average not less than one square foot for every bird. Overcrowding retards growth and frequently results in high mortality. Cleanliness means using an absorbable litter and the daily removal of the night droppings from under the hovers; this latter is certainly essen-

tial. I have already said something about ventilation; provision must be made for a constant circulation of fresh air. Windows should not form the only means of providing it, although on warm days they should be used as a supplement. Feeding is a subject with which I have yet to deal.

However, granted these conditions, and the worker knowing his job and doing it, then chickens can be successfully reared indoors on solid floors until they are forward enough to thrive without artificial heat, even up to eight weeks in winter. It is true that under normal conditions the birds could safely be liberated at a very much earlier stage; but, let me repeat, the normal conditions of winter in this country are seldom equal to those of the natural hatching season of spring and summer. Where the wire floor is beneficial is in saving space and in reducing the danger of disease to a minimum. Many more chicks can be reared, during the time they require warmth, in a given space; and the birds are removed from their droppings. It is claimed by some that the use of wire floors very considerably reduces labour. It certainly makes the removal of the droppings less of a task. Nevertheless, chickens which are reared by this method require as much attention as do those being kept on solid floors. That it is becoming understood there is no doubt; and the latest development is in the rearing of ducklings on wire-netting.

Hovers on Wire Floors

There are two ways in which it can be accomplished, viz. with ordinary hover brooders in specially constructed houses, or by one-tier or two-tier—single or double unit—rearers indoors. So far I have not operated the wire-floor brooder entirely out of doors, although it might perhaps prove successful as an outside rearer for chickens hatched in summer. In these two systems of wire-floor brooding—distinct from battery brooding with which I deal later—the birds are heated by means of wick-burning oil lamps or stoves. No doubt electrical heating devices could be substituted; but, even to-day, electricity is not available in all localities. I have to get along without it; but paraffin oil answers excellently for incubators and rearers alike.

The idea of this particular style of brooding—with separate heated chamber—is similar to that in ground rearing on solid floors, viz. to enable the chicks to get away from the heat into cool air, and thus become gradually hardened, because neither the room nor the brooder house is specially heated. What I term the unit combination (for use in almost any room) does look like a battery brooder, and especially when it is in double or treble tiers, but it is not supposed to be strictly battery brooding as this method is known to-day. Special accommodation is required when the ordinary hover type of brooder is in use; and such a house, on a large scale for commercial purposes, I have in mind as I have an idea that, for the ordinary poultry-farmer who is not a specialist hatchery man, it will prove of service, not only for brooding and rearing, but also for young stock or layers.

Already a house of this type has been erected on our farm; and when time can be found to carry out the necessary work it will be fitted up to our plans. It is 30 ft. long by 10 ft. deep, 6 ft. high in front and 8 ft. at the back, and it is divided into three sections. Its sides are solid, and so is the back, except for three windows, 2 ft. by 3 ft. (long), about 5 ft. up. The bottom 3 ft. of the front is of timber, and the remainder consists of windows reaching to within 6 in. of the top, which space, covered with perforated zinc, is a permanent ventilator. There are ventilators also over the windows in the back, while, to permit of the maximum light, there are fifteen fixed roof lights, each 1 ft. by 1 ft. 6 in. The chicken flat, with a floor made of heavy gauge ½ in. mesh British wire-netting, will be 3 ft. from the ground with the usual droppings' tray; and when in full working order it will hold between 700 and 800 chickens, with the necessary hovers for the heating. There will, of course, be wire-netting partitions, while the birds will be managed from a 3 ft. wide passage way at the back. The ground floor will have slatted bottoms, and the sections will thus act as houses for young stock; and since these slats and the wire floors, etc., will be movable, the whole place can be cleared when the chickens are off hand, and converted into a semi-intensive house for laying stock.

A Two-tier Non-battery Rearer

The type of wire-floor non-battery rearer with which we have been working this past season or two is a double unit combination for 250 chicks. Such, at any rate, is its advertised capacity, but we found that 100 chickens to each unit were quite sufficient, the chickens being White Wyandottes and Rhode Island Reds. It has given entire satisfaction in one of the ground-floor rooms of the granary. This room is brick-built with concrete floor, cemented inner walls, and a solid wooden beamed ceiling—the floor of the loft. It is 10 ft. high and has a floor space of 14 ft. by 8 ft. The light comes through two big windows —facing about west—these windows being one-third fixed (at the bottom) and two-thirds drop in, somewhat like those I described in Chapter III when dealing with the modern laying house. Wings were fitted to them to prevent side draughts; and a double door was fitted in the 3 ft. wide entrance to the room, 6 ft. high overall with a window in the top section of

it, and a ventilator above. This room leads off what may be termed the porch of the granary and is not entered directly from the open air. It has also been used successfully for ground rearing, with the usual

FIG. 120. BATTERY BROODING
An interior view of a battery brooder house on an Essex poultry farm, with the double-deck brooders referred to in this chapter

canopy type of wick-burning hovers; and in each case it is possible to ensure fresh air without any damaging draughts—at no time has there been any sign of chilling among the chickens, while no difficulty has been experienced in maintaining a room temperature of around 60° F.

This particular double-unit wire-floor rearer is a very easy appliance to work, even down to the oil-heating equipment, which is certainly one of the simplest and most effective methods I have ever handled in this direction. Each unit has a sleeping compartment, heated from underneath the wire floor by a special stove, which burns on a quart of oil for from three to four weeks without attention, after which time artificial heat can be entirely dispensed with, except during the height of winter. The temperature in the sleeping compartment is regulated by an adjustable canopy which, by a special arrangement, can be instantly altered to any of four different heights. The feeding and water troughs are so designed that there is the very minimum of waste, while the water trough, at the end and fitted with a grid and glass panel, is so made that it can be placed inside the brooder for the first few days, thus acting as a barrier and preventing the chicks straying too far away from the heat until they get accustomed to it. The floors are of heavy gauge ½ in. mesh wire-netting, and this I find in every way equal to square mesh woven wire—which costs much more—if it be properly stretched. There is ample space between the floors and the droppings' tray to ensure proper sanitation; and if the trays be covered with newspaper the removal of the droppings can be effected in a few seconds. The gridded food troughs, fitted to each side, permit of the whole of the chickens feeding at the same time; and there are removable glass panels at the back to protect the birds while they are feeding.

This brooder is certainly a simple one to work, while it is so designed that, apart from the droppings' trays, there is hardly a part of it which requires cleaning, although, of course, cleanliness must be observed in chicken rearing. What I like about it is the ease with which the chicks may be handled, because by removing any trough the worker has full access to the interior. And since the birds get away from the heat into the cool air, they may safely be removed from the brooder at six to ten weeks old, according to the season, directly into a Sussex night ark without receiving a check. It is a decidedly handy appliance for poultry-keepers who operate incubators of the size I suggest for the novice; and it is much less trouble to attend to than broody hens or small unit brooders for a similar number of chicks. There is just one thing to observe in connexion with it: chickens which are caged are apt to be more nervous than those which have their freedom on a solid floor. Hence the attendant must avoid doing anything likely to startle

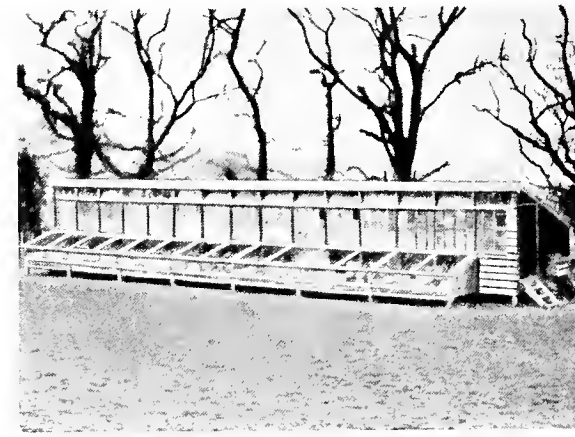


FIG. 121. A SUN-PARLOUR BROODER HOUSE
A brooder house fitted with sun parlours or balconies for winter rearing. The idea of these balconies is to ensure the birds getting plenty of direct sunlight, and, too, fresh air, when the ground is not in a fit condition for them

or upset the birds. It is often due to nervousness that chickens take to feather picking, and develop other vices.

Sun Parlours for Intensive Rearing

Yet another system of rearing chickens, which has come into vogue during recent times, is that which includes the use of sun parlours or balconies. These latter are practically outside runs with wire-netting

floors; and they are attached to the whole front (south) of the house or cabin in which the hover or other form of artificial heater is located. Hence, chickens which are so accommodated can be allowed outside the house for direct sun and fresh air without their feet touching cold or wet ground; but, obviously, such an airing can be permitted only when suitable weather conditions prevail, and even then the chicks do not always seek it. This method does not amount to complete wire-floor rearing, because the floor of the house is solid; and it is generally made of timber, well littered, of course, and fixed at least 1 ft. from the ground. It first came under my notice some twelve or thirteen years ago, as a new method of brooding chickens successfully throughout winter on the intensive system. Its chief advantage over indoor brooding is that, in its present form, it enables the litter to be used for a longer period.

When it was first brought out in America the open sun parlour was made to extend 6 ft. to 8 ft. from the front across the whole length of the house; but the floor was solid. Those who, at that time, advocated its use insisted that cinders or slag should be filled in to a depth of eight to ten inches, presumably to provide good drainage. Moreover, if the brooder house were in an exposed position the parlour had to be enclosed on the east and west sides, and sometimes on the front (south) as well, to make it as comfortable as possible for the chicks while they basked in the sunshine. One authority who was keen on it said that, when the open sun parlour is protected from the wind, the accumulation of heat on the south side of the house, with absorption of the heat by cinders, causes the snow and ice to disappear rapidly upon the first appearance of sunshine, and "it is surprising how the chicks will learn to enjoy the sun whenever it shines." The whole idea, as can be imagined, is to allow the birds to have direct sunlight, so that they can benefit by the vitamin D—sunlight factor—which is obtained by sunlight passing through an open space unfiltered, and not through a glass window. But, in this country, at any rate when cloudy weather prevails, these parlours are of little use for sun basking, and the chicks seldom use them.

When fitted with wire-netting floors, however, they undoubtedly prevent a certain amount of excrement fouling the house litter; and, provided they are big enough to permit the whole of the brood sufficient room in which to enjoy the benefit of direct sunlight, when the sun shines, they should prove beneficial. Particularly would this be the case if the brooder house were so made that sunlight could not penetrate the front of it, or if the size of it were such that the chickens were cramped for room. When the youngsters have to be reared intensively throughout winter —that is, confined to the ordinary brooder house for ground rearing for the first three months—they should have double the floor space of those which have their freedom. In such circumstances as these, therefore, an hour or so on wire floors around midday, when the weather permits, should give them a change; and it might also prove beneficial in obviating any trouble from cannibalism. It is always as well in intensive rearing to encourage chickens to perch as soon as they are off brooder heat. In fact, early perching is more important for them than for those which are given their freedom when the change to fresh quarters is made.

Battery Brooding

There is still another system of brooding vast quantities of chickens by artificial means which has come prominently to the front of recent years, viz. in batteries. At any rate, this phase of mass production is now called battery brooding, although, when it was in practice in Belgium and other parts of the Continent before the War, it was referred to as "intensive tier or shelf brooding," and also as "cage rearing." Perhaps it got its present name because, according to the dictionary, a battery is "a group of cells"; and these tiers of cages in which the chickens are imprisoned during their very intensive brooding reminded someone of a group of cells. However, something had to be done to keep pace with the mass methods which it has been found necessary to adopt in other sections of the poultry industry during quite recent times; hence this tier system has been revived for rearing. And now that vast improvements have been made in the construction of appliances, it is attracting very considerable attention.

Its chief advantage is the great saving of space it ensures. Some claim that it reduces labour to the minimum, which is true to a certain extent; but that it does make for almost perfect sanitation—and thus assists greatly in eliminating certain chick diseases—there can be no doubt. Nevertheless, to be successful with the maximum of chickens on the very minimum of space, it is more than ever essential that only experts at chicken rearing should handle it.

Even in its present form it is not such that it is likely to appeal to the stock raiser who limits his young birds to about a thousand head per annum for replacements, or to those who rear on small lines, simply because the cost of installing it on such a scale would not be justified. But although the capital expenditure for the outfit is high, it is proving a boon to commercial men who rear several thousands of chicks at all seasons of the year when catering for the live chicken trade and those who supply the markets with table birds. It is an essential appliance

when mammoth incubators are being operated. It must be understood, however, that the battery brooder system is suitable for the skilled worker only and not for the average poultry-keeper. It is probably the best method for those engaged in large-scale operations. That the old-time trade in eggs for setting is gradually being replaced by ready-hatched chicks is very evident in the vast quantities of day-old chicks which are disposed of annually from the commercial hatcheries, while there is an increasing market, also, for chickens of an advanced age, and especially for those which no longer require artificial heat. However, because few if any of these hatcheries which have sprung up to cope with the demand keep the necessary birds to produce the eggs, there is plenty of scope for those who wish to specialize in breeding stock. In my opinion this part of the industry can be developed into a very remunerative one.

The battery brooder is for the skilled worker only; and for this reason—while it may amount to no more than the application of old principles to new conditions, there are so many problems in connexion with it that it requires more than a superficial knowledge of artificial rearing if success is to be achieved. And since it is by no means rare, with big installations, for thousands of chickens to be kept in one room, the dimensions of which would accommodate scarcely one-hundredth part of the quantity were they to be spread over the floor under the ordinary brooder house system, it can be imagined that vast experience of rearing is essential. So advanced has it become that, when a complete system is installed, the chickens never touch the ground from the time they leave the incubators, being kept throughout on wire floors to their final stage—killing for market. These plants include, in the one building, the brooder section, the cooling-off room, and the fattening pens, each being quite distinct from the other. This is, indeed, mass production to the extreme limit; and yet it is being successfully carried on in this country.

However, it is with the brooding that we are concerned in this chapter. Prior to the War little was heard of battery brooders as such in England. Some years before 1914, at least two methods on somewhat similar lines had been tried out here; but they were failures, no doubt owing to lack of knowledge concerning accommodation, although the feeding of chickens under these changed conditions was not understood. But battery brooding has been very carefully investigated since those days, with the result that thoroughly reliable appliances are now on the market, while properly balanced foods are available. Hence, those who wish to go into the matter as a business proposition have ample opportunities for studying the subject.

For Stock and Market Chickens

With proper supervision chicks can be successfully reared for stock on the battery system for the first few weeks, that is, until such time as they require to be hardened off before they are passed out for field use. In this case the chicks should be out of the batteries, at latest, by the time they are three weeks old and transferred to ground rearers at the usual temperature. Here they should be kept for the next three to four weeks, and then put into night arks. They can be weaned from heat at five weeks old, except during severe weather; and this, of course, also applies to the age at which they should be transferred to night arks—not always is it advisable to change their accommodation when they are six to seven weeks old. As is only to be expected, there are several types of these brooders on the market, as there are of incubators, houses, and practically every appliance which can be used in connexion with the keeping of fowls. But while some batteries may be suitable as brooders for chickens up to ten weeks of age, I think it will be found best not to exceed eight weeks at any time of the year, transferring the birds at such an age,

FIG. 122. BATTERY BROODING
The hardening-off battery in the room to which the chickens are transferred before being put out of doors

or even earlier, to cages or flats for hardening them. On no account should they be put into arks or outside chicken houses direct from the heated brooder room.

As already mentioned, it is possible for market chickens to be brooded and developed to the killing stage in battery cages. It is also possible to rear pullets in a similar manner, and to keep them during their most prolific periods, that is, throughout their first and second laying seasons, in batteries, each in a cage by herself. And it was owing to the success met with in the battery brooding of chickens that "hen batteries" were experimented with and eventually perfected. I know from experience that the battery brooder system keeps labour costs low; but this is only because it enables one attendant to look after a very much greater quantity of chickens than he could do were they being ground-reared. Nevertheless, the successful working of a small installation requires almost constant attention, as there are many details connected with it. Such matters as filling the mash hoppers, cleaning the water troughs and the droppings' trays, moving the chickens to different tiers as they grow, and so forth, may appear to be trivial items which could take up but little time; and yet, undertaken by an intelligent youth who is thoroughly accustomed to chickens, they occupy much of his day. And that is not all one has to do in battery brooding, because temperatures must be watched, and an eye must always be kept on the chickens. One has to be particularly careful and reasonably quiet when going about the work, especially after the chicks have been in the batteries about a week. Much more "hen sense" is necessary in such circumstances than is the case when chickens are being ground-reared at practically free range. Quietness is important. Chicks are easily startled when in the batteries, and once they have been scared it is naturally some time before they can settle down again to quiet feeding. Hence, to succeed with them one has to exercise plenty of intelligence. It is most advisable, when possible, for one attendant always to take care of the birds; and he should, of course, do all the work quietly and with regularity.

Even such a small matter as removing the droppings, an essential part of the day's work, has to be undertaken with great care, because, although the tray may be covered with paper to facilitate the cleaning process, it has to be taken out. Any undue noise in doing this may cause the chicks to scramble over each other; and this might result in injury to some of them. Now it must not be supposed that when attending to battery-brooded birds one has to glide about in ghostlike fashion on tip-toe. That, of course, would make matters very much worse than they should be; and it is certainly not advised. All the same, it is infinitely better, for instance, to don rubber-soled shoes than hob-nailed or iron-shod clogs, and to move slowly, to avoid dropping pails or other utensils, and to keep noise to the minimum, than to bluster about. Moreover, doors can be quietly opened and shut. It is a serious business, admittedly, but it need not be a sad one. Just exercise a reasonable amount of care; and if you must "talk" to the chickens—it is a habit with some of us, and does much to accustom them to humans—let it be done without shouting. All young creatures, whether they be chickens, children, kids, kittens or calves, respond better to gentle treatment than to harshness; and especially do I find this so when chickens have to become accustomed to the unnaturalness of a wire floor. They will get used to it in time, of course, and many a fine sturdy bird has been reared in such a way.

Advantages of the System

However, to return to the battery brooder system. An advantage it possesses is that, as the whole of the hatch is located in one room, the chickens can be controlled in a comparatively easy manner throughout their earlier stages. In this way it is possible to have hundreds of them under one's eye at the critical ages; and they can be attended to in less time, and with nothing like the trouble which is necessary when a similar number is spread out one layer deep as in ground rearing. In addition to this, they can be more easily handled than birds in brooder houses; and although some workers do not actually handle the chickens when they are being transferred to the different tiers, or to the hardening-off cages, it is preferable to do so, because the condition of each one can then be ascertained.

The system is certainly designed to ensure the health of the birds, because their excreta, falling through the wire-netting floor, are well away from their feet, and cannot possibly contaminate the food or water; and, moreover, the chicks have rather less inclination to crowd together for warmth, provided the temperature of their quarters is properly regulated. Ample air space and good room ventilation are essential. The principle of battery brooding is the same as for ordinary artificial brooding, but the appliances themselves vary more perhaps in the way they are heated than in actual design. No matter what style is adopted, however, there must be adequate circulation of fresh air.

The type of house required for the brooder varies according to the system in vogue; but most manufacturers of battery brooders supply the complete plant. Some workers do not permit the chicks to enjoy sunshine or fresh air direct from outside the house, while others allow free access to sun and air during

suitable weather. As a matter of fact, almost any substantial building can be adopted for the purpose, provided certain essentials are observed; but in this case it is most advisable to consult an expert concerning its ventilation, or to get the manufacturers of the special equipment that is being purchased to see what, if any, alteration is necessary, or, indeed, whether the building can be utilized for the accommodation of the battery.

One of the most successful plants of this description I ever inspected was located in a converted cow-shed, and it accommodated 3000 chicks. It was brick-built, with the usual tiled roof and concrete floor, and floor ventilation by perforated bricks. A wooden ceiling had to be fitted, level with the walls at the eaves, and in it were two ventilators leading to the Louvre box in the centre of the ridge. The south side had windows, to allow the maximum of light, and they were made to lift out easily to ensure fresh air when necessary. The windows were fitted with special glass; but the usual window glass will do if it is kept perfectly clean. Admittedly, this method of lighting and ventilation was not the usually accepted one at that time for a battery brooder house; but it certainly ensured sturdy chicks and, what is more important, an almost total absence of cannibalism, which is generally one of the greatest bugbears in battery brooding.

Some Essentials to Success

Ventilation must be ample and easily controlled. It is essential to have pure air in a room containing vast quantities of chicks; but, as in almost any building used in connexion with fowls, young or old, they must not be in a severe draught. In my opinion it is a great mistake to attempt to rear in a room which resembles a forcing house for plants; and more than one failure in battery brooding can be traced to an insufficient supply of fresh air. But ventilation to ensure fresh air is all-important, and unless it is perfect success cannot be achieved with battery brooding. There must be ventilators on the ground level and in the roof, so that, while draughts are eliminated, there is a steady flow of pure air through the cages from floor level. Lighting is as important as ventilation; so, rather than prevent chickens getting in the sunshine, I should let the house have the maximum window space, but with the light diffused and certainly not in concentrated rays. This latter would be the case if the sun shone into an otherwise dark room through small windows; and whether the chicks were in batteries or on the ground, it would cause them to crowd to the sunniest spot, which might be detrimental.

Humidity appears to be necessary, and some batteries have special devices for supplying it. Nevertheless, during the early season in most parts of this country there is generally sufficient humidity in the atmosphere, and, combined with the water which must be kept in the drinking troughs, it should meet all requirements in this direction. Swilling the floor or keeping pans of water about the room may be advisable in dry weather, although it can very easily be overdone, in which case it would cause too rapid growth and, consequently, result in general weakness. I have certainly not found it beneficial to add moisture to a brooder house, or to the room in which the double unit combination is worked, even in summer.

As in other forms of artificial brooding, it is, of course, essential to study the temperature. In this system, though, it is a mistake to attempt to work with a very high degree, as it has been found that chicks develop in a better manner with slightly lower temperatures than usual. At any rate, they are hardier than those which are kept too warm in the batteries. About 80° F., under rather than over, is suitable for day-old chicks in batteries, and 70° F. for month-old birds. In some brooders the chicks are moved down one tier each week, and the temperature is reduced a few degrees with each move; that is, the heat of each tier is a certain number of degrees less than the one above it. In others, which I prefer, there is a cooling portion, where the chicks can get away from the heat; and they need not be changed about. This is a point which wants watching; and the attendant must be guided in the regulation of the temperature by the appearance of the chicks. They must be kept warm enough; but more harm is done by overheating than underheating in battery brooders. A hot and dry atmosphere is injurious; and chicks give much better results as regards growth and general health with a somewhat low temperature. I am convinced that in this country, in the south of England at any rate, some batteries are worked at too high a temperature, and without sufficient light; and it is largely due to this fact that complaints are made that battery chickens are not the best for stock purposes.

Overcrowding must be avoided, not only on the floor but as regards accommodation at the food troughs; ample feeding space must be allowed. It may not be that the whole of the chickens eat at exactly the same moment, and particularly when they are in their earlier stages; but once they have found their appetite, as it were—and that is generally by the time they have got accustomed to the wire floor—the majority will be feeding together, as it is usual for the bulk of them to be attracted to the troughs by the few forward birds having a meal. It is advisable, therefore, to allow trough frontage for at least half the number to eat at the same time after the first week or so; and for this purpose perhaps one inch for each bird will not be too much, from a fortnight

onwards. The troughs, of course, are outside the cages; and I find it preferable to permit the chickens to eat—and drink—through perpendicular wire bars than through wire-netting or plates pierced with holes wide enough only for their heads, because it is possible, with the bars, to adjust the feeding space as desired. No matter which method is used, however, there is always a fear that one or two of the chicks will squeeze their way through at first, since when large numbers

FIG. 123. BATTERY BROODING
A section of the battery brooder room of a well-known Yorkshire hatchery

of them are being brooded together it rarely happens that all are of exactly the same size. And, as some chicks do seem always to show a strong suicidal tendency, it is advisable so to cover the troughs that any such irresponsible birds will not leave them at the wrong side and land on the floor.

This often happened in the early days of battery brooding; but most of these troughs are now fitted at the back with wire gauze, ½ in. mesh wire-netting, perforated zinc, or glass panels to prevent it. In any case, though, the attendant should keep an eye open for any such eventualities, because accidents are common during the rearing season, and under the best system of artificial brooding yet invented chickens need constant observation. One or two in the food trough may not come to much harm, although they are almost sure to foul the food; but it is a very different matter should a chick get into the water trough, since it would probably die from the effects of chill, or get drowned. The best that can be done is to use shallow troughs for the first few days; and this means seeing that food and drink are in good supplies. The food and water vessels could extend the whole way along the four sides of the cage, but only one need be used for water.

Floor space, to prevent overcrowding, is a matter which might well be left to the man in charge. The birds must have room to move about, because, as can be imagined, they are deprived of scratching exercise. In my experience 12 square inches a head is really not too much for day-old chicks, while before they are a month old they will probably require twice as much floor space. This may be considered excessive for some breeds; but there are makers of battery brooders—as also of artificial hovers for ground rearing, and, indeed, incubators, chicken arks and stock houses—who have a habit of overstating the capacity of their appliances.

Various Designs of Batteries

I have said so much of battery brooding, and yet the novice is probably in the dark concerning the brooder's construction. There are, however, many detailed variations of this type. The battery may consist of from three to six tiers or decks of cages, with trays or drawers one above the other, somewhat like a tallboy. In some of them the cages are square, approximately 3 ft. to 4 ft. and varying in height from 6 in. for day-old chicks to 9 in. for birds of a month; in others they are long and narrow and stacked back to back, and these latter are the easier to ventilate. The floor consists of ½ in. mesh wire-netting, either specially interlocked with square mesh, which is expensive compared with round galvanized British wire-netting, of the usual shaped mesh, which answers in every way. Some brooders have ⅜ in. mesh wire for chickens up to three weeks of age, and ½ in. mesh for those beyond that age; but I find that the latter is suitable for all breeds except bantams, although one would be foolish indeed to attempt rearing the miniatures in batteries. There is a space of 4 in. to 6 in., sometimes more, between the cages and under the bottom tier, to hold the tray or drawer which acts as the droppings' board—it fits on the roof of the cage below—and to permit of air circulating around the chicks. These trays are made to pull out for cleaning; but if they be covered with a sheet of paper it considerably facilitates matters and obviates the noise made by sliding the tray.

In some of these appliances the food and water

troughs are so made that they form the sides, but in others the vessels are hung on the outside—in either case the birds must put their heads through the sides to get what they require to eat and drink, because only the chicks should occupy the floor. As previously remarked, the sides may be made of straight wire (upright), of 1 in. to 2 in. holes cut from sheet metal, or wire-netting with the twisted strands running perpendicularly—the last-named being of 1 in. mesh for day-old chicks and up to 2 in. mesh as the birds develop. The floor is tautly stretched to prevent sagging, because were it to sag it would encourage the birds to crowd to the centre, with very damaging results. As soon as the chicks are hatched out and dry they should be put into the cages; and, as with other systems of rearing, whether natural or artificial, there they should be left for twenty-four hours without food or water.

It is most unwise to overcrowd the cages at any stage, and the maximum for the first one (day-old chicks) should be around 100. This number wants reducing almost daily after the first ten days or so. At the end of that time, and certainly before they are a fortnight old, fifty should be the maximum, while not more than thirty should be together at the end of six weeks, that is, in cages of the same floor space, but always with the height of the cage increasing as the birds develop. Give them head room. If they have to be brooded for a longer period—some operators remove them from heat at a month old, others even before that age, according to the season—a score should be the maximum for 3 ft. square floor space at seven weeks and a dozen from about nine to twelve weeks. This is well on the safe side; but better be safe than sorry. The most usual method of heating is by anthracite stove and hot-water pipes, the radiator running down through the middle of the stack of cages, so that the chicks can control their heat requirements to a considerable extent by getting close to or away from the radiator.

Electrical poultry appliances have come much into vogue of recent times, and electricity is used in incubators (both small size and mammoth cabinets) and all kinds of brooders—batteries, indoor hovers, and outdoor foster-mothers. The several ways in which it can be employed were mentioned in a paper [1] read at the Farmers' Electrical Conference held at the Royal Show, Ipswich, 1934. There are various types of electrical battery brooders, single or multi-tier, with a warm compartment at one end and a cool feeding compartment at the other end, which encourages the chicks to keep on the move and helps to harden them. The heat may be provided by tubular heaters, dull heater boards and plates, or frosted radiant lamps fixed to the top or sides of the brooding compartment. There are also makes employing an electrically-heated hot-water system with hot-water pipes in the compartment, heated by a small water boiler on the floor, into which is inserted an electrical immersion heater which may be thermostatically controlled. Practically all makes have a method of heat control, either by switches or, preferably, by a thermostat. Electricity is clean and safe to use; but such brooders are generally expensive to install for the ordinary poultry-farmer, while the running costs are often high.

[1] A copy of this paper, "What Electricity is Doing in the Country, with Special Reference to Poultry Farming," can be obtained from the Secretary of the British Electrical Development Association, Inc., 2, Savoy Hill, London, W.C.2.

Some Chick Vices

There is a belief that battery brooding leads to vices such as cannibalism, toe pecking, vent pecking, feather pulling, and that it causes poor feathering, weak legs and other troubles; but, while there is perhaps a greater tendency for any or all of these set-backs to occur when chickens are closely confined in large numbers than when a few of them are in charge of a reliable broody hen, it is largely a matter of management, of the attendant's own personal care, whether chicks which are hatched fit—strong and full of vitality from vigorous breeding stock—will mature without some trouble or other. Cannibalism in batteries is largely due to excitement, excessively high temperatures, overcrowding, faulty light, and unsuitable food. Then, too, if the wire-netting on the floor is not perfectly smooth and free of rough edges, jags or points, it may lead to foot injury; and the slightest sign of blood on a chicken's foot is likely to end in toe pecking. Unsuitable food which prevents the free passage of excrement, or chilling which results in a similar state, may lead to vent pecking. The provision of insufficient trough space; overcrowding; shortage of food or water; carelessness in the matter of cleanliness; all are among the little things which lead to trouble. They can be avoided.

Granted the attendant has knowledge and experience of chick rearing, and that strict attention is paid to details, there is no reason why birds which are brooded in batteries for a reasonable period should not compare favourably with those reared by any other method. It is a fact well known to users of batteries, whether of the single or multi-tier type, that chickens brought up under this system are prone to be more nervous than those which are being ground-reared. It is certainly my experience; and the nervousness does not end immediately they are removed from the battery and given their freedom. They still require considerable attention at first, not only to get them accustomed to their fresh quarters

and the new mode of living, but to see that they do not huddle together too closely from mere fright.

Great care must be exercised in their management during the first few nights. Most of them will probably have to be put into the sleeping quarters, even though it be a chicken ark with the slatted or wire-netting floor some six inches or so from the ground, and with a proper runway to the entrance of it. Not only so, but they will have to be visited within an hour afterwards to make certain that they have spread out and are not sleeping in a mass, with the smallest of them almost crushed. However, those who thoroughly understand the requirements of chickens, correct feeding, and hygienic conditions, will be well equipped to make a success of battery brooding. It will mean paying attention to details, and not neglecting the smallest of them. This system is for the practical man to operate, as it has its own problems. Inexperienced poultry-keepers, therefore, will be wise to stick to more conventional methods of brooding; and until they are prepared to go through with it in a complete manner with one who is making a success of it, they should leave it severely alone.

General Management

No matter whether chickens are hen-reared or brooded by artificial means, they must be kept scrupulously clean if they are to become strong and healthy. They may be fed on the best foods obtainable, but if their night quarters are neglected they will not thrive. They pass their early days in exercising, eating, and sleeping. It is surprising what an amount of excrement collects in the coop or hover from night to morning. Hence the droppings must be removed each day; and, unless the birds are on wire floors, their bedding must be changed as often as necessary. Even when on wire floors, it is essential to clean the trays at least once *per diem*, and particularly during muggy weather. In any case, though, nothing is lost by including this in the daily routine.

The attendant must keep an eye open for lice, since, while battery-brooded chicks are generally free of such insects, it is not so with those being ground-reared; and the pests are apt to attack the birds when they are about a fortnight old, appearing on their heads, throats, and necks. It was once thought that only chicks brooded by a hen were subject to lice; but they have attacked artificially-reared birds, owing to filthy litter. Nevertheless, there is really no excuse for allowing chicks to become so infested, because if their sleeping quarters and small temporary runs are kept clean, and the birds are provided with a heap of dry earth in a sunny corner, or with a slight hollow under bush or tree, they can be trusted to wallow and dust, as their natural instincts teach them.

Chickens should be allowed to have a dust bath; and, although they do not get it on a wire floor—they should not require it when so kept—they will indulge in it when at liberty. Unlike the young of the waterfowl, they do not take their ablution in pond or water trough; they clean themselves by rolling in earth or in some other substance. No matter how small their run, therefore, it should not be a difficult matter to provide them with a suitable spot. A heap of dry earth, of granulated peat moss, of coarse sawdust, is always appreciated; but on no account should ash or fine dust from the fire grate be put down for them, because it is too light to be of service, and, moreover, is very apt to injure the birds' eyes or plumage, and cause skin irritation. I recollect a White Wyandotte chicken being sent to me by a correspondent, who had several which had suddenly gone blind. On my examining the bird I soon discovered the cause; and this was confirmed on my making full inquiries—this eye trouble was due simply to the fact that the chickens had been permitted to dust on a patch of burnt-off gorse land. Treatment was advised, and they recovered their sight. If there are bushes in the run the youngsters will make their own dust bath. Otherwise, put a heap or two of freshly dug earth down for them in sunny corners, and border the places in such a way that the birds cannot scatter the litter in all directions, and thus give the run an untidy appearance.

If coops or small outdoor rearers are in use, occasionally changing the site of them will prove beneficial, because the ground in the immediate vicinity is apt to get foul. When the move is made, rake off any loose material and give the place a thorough scratching, or, if of earth, spade off about two inches of the surface and replace with fresh material. It must not be thought that a vast extent of land is necessary to enable one to succeed at chicken rearing. As I have shown, birds can be brought along in battery brooders, which are accommodated in a comparatively small space. But, in the ordinary way, sturdy chickens can be reared from the shell to the laying stage in a suburban garden; and many a brood is so developed each season. In these circumstances, admittedly, it would scarcely be wise to let them have the range of seed beds, even in their very earliest days, although they would improve rather than damage the usual flower patch, even if they did scatter the earth at times. A small lawn will accommodate an artificial rearer or a couple of coops with hens; and, such a place, with beds adjoining, makes an ideal chicken ground. The short grass provides the birds with excellent green food, while the loose earth in the beds permits of their taking plenty of exercise. Granted there is a little extra work attaching to the

rearing of chickens in such confined quarters, because the grass will have to be flicked over with a birch broom each evening when the chickens have been shut in, and there will be other tidying-up jobs, but one need not despair of raising healthy chickens if a garden is available.

When Chickens are on Range

That is, of course, rearing poultry on small lines. When large numbers of chickens are being dealt with, and outside accommodation has to be found for them, then it is essential to keep them on a distinct range, and quite apart from adult stock. In such circumstances, a section should be set aside solely for their use, leaving it fenced in and given over to the chickens each year, so that, when rearing is finished for the season the ground can be vacated, and, if deemed advisable, limed or treated in some such way that it can be kept "sweet." Even when the young birds are being folded, which is the method of rearing on some farms, these pens should not be accessible to the layers and other stock, because as a rule the old birds spend much of their time around the folds, no doubt hoping to get some of the food put down for the chickens, and thus worrying the youngsters. But while, as I am aware, there are farms at which no attempt is made to keep young and old poultry apart, and where the custom is to allow fowls, ducks, geese, and turkeys, and probably guinea fowl as well, to mix as one flock, it is a decidedly slipshod way of managing feathered stock, and is not the method to adopt to ensure good results from chicken rearing. It is undoubtedly due to such ways as these that poultry-keeping on some farms is anything but a success. Admittedly, on practically free range, more than one species of poultry can be kept without fencing; but during the rearing season there should be distinct quarters for the young birds, if merely so that they can be fed for growth.

FIG. 124. A PRETTY SNAP ON A MIDDLESEX POULTRY FARM, SHOWING IDEAL SURROUNDINGS FOR THE REARING OF CHICKS

It is very necessary to keep a strict watch over the chickens to protect them from mice, rats, and other vermin. Mice do not kill the birds, as do rats, stoats, weasels, and similar animals, but they are apt to pollute the food and litter, and thus they may poison the youngsters. I confine my chickens to sections of their range with 2 ft. high fences of 1 in. mesh

wire-netting, until they are of an age to take care of themselves. These runs are temporary affairs, but the netting is securely pegged down. Moreover, to prevent any hiding places, the grass in the enclosures, and in the immediate vicinity outside, is kept closely mown unless, as sometimes happens, tufts of nettles or coarse herbage are left in the runs to act as shade for the birds, and also to encourage insects, which chickens appreciate. An eye is kept open for rat runs. In addition to this, three dogs—two or three are generally kept for use on the poultry farm—are always taken around at meal times and in the evening, when the birds are shut in, while the cats, trained to fowls and chickens from kittenhood, are allowed the freedom of the pens.

Although cats are almost invariably a nuisance when chickens are being reared in towns and residential districts, I have not found mine troublesome when rearing in the "out beyond." Perhaps it is because the game-keepers never encourage cats to roam around; or maybe the animals find enough natural food in the form of rabbits and rats to satisfy their craving for raw flesh. Certain it is that those which are brought up on our farm—and it is by no means rare to have three or four adults and half a dozen or more kittens about the place—are allowed to mingle with the fowls, while the kittens, always severely checked whenever they show signs of pouncing on a chicken, soon learn to leave the birds alone and may safely be permitted in the runs. I find that well-trained dogs and cats are valuable creatures to have on a poultry farm, because seldom can such places be kept free of vermin without their aid.

Accustoming Chicks to their Quarters

No matter whether few or many broods are being reared, the coops and hovers should be placed as far as possible from each other as soon as the chickens are allowed their freedom. As I have already mentioned, it is a good plan to have a small wired run attached to each coop or rearer for the first few days, to enable the chickens to get accustomed to their home so that, when at large, each lot is likely to return to its own sleeping quarters. This is especially important when artificial methods are being followed on a small scale, because on no account should the broods be allowed to get so mixed that more than the requisite number will go into one night compartment; otherwise there will be undue crowding and overheating, and deaths will occur. When hens are employed there is little fear that the mixing of the batches will force the chickens to be brooded at a wrong temperature. The heat of one broody hen differs little from that of another; hence birds which are mothered at a right temperature by one hen would not be chilled or overheated if they happened to wander into the wrong coop. But this seldom occurs, because the most gentle of "cluckers" generally resents strangers taking up their quarters under her; and the unfortunate youngster who strayed might have a very rough time were it to attempt to roost in the wrong coop.

FIG. 125. A SECTION OF THE CHICKEN GROUND
A row of single coops with chickens of the same colour, in this case White Wyandottes

Some poultry-keepers who go in for hen rearing—and there are many who do so on quite a large scale—have differently coloured hens for each brood, a white for one, a red for another, and a black for a third, and so on, the idea, of course, being to assist the chickens to recognize their own home. Then, again, others mix the broods, allowing each batch to consist of different varieties and not of one colour only, while some rearers use the same colour of broody hen all through. Such methods as these have been adopted with success. They may appear to the novice to be altogether unnecessary; and yet, if some such plan can be managed it cannot do any harm, and it may perhaps be the means of reducing the risk of chickens getting injured through straying into the wrong coop. According to naturalists each mother hen has her own peculiar call, and each batch of chicks is supposed to be able to differentiate between those calls. Possibly they can do so; then it must be that some chickens, like some children, are wayward and must suffer in consequence. Still, to be on the safe side, it is advisable to leave as much space as possible between the coops. At any rate, unless the hens themselves are thoroughly accustomed to each other, such a plan is much better than setting the coops in a row and letting the youngsters take their chance. After all, much depends on the hens. I have often seen three or four of them with their broods wandering around amicably together; and I saw a couple of hens settled for the night in a coop, in the same nest, with a batch of chickens between them—their usual custom I was told. In each case they were farm-hatched hens, brought up to look after themselves from the shell.

In the rearing of poultry it is most unwise to let old and young birds run together and mix indiscriminately. Even when chickens are confined to coops, folding pens, or rearers, these appliances should not be placed where adult stock can interfere with them. For some reason I have not yet been able to fathom, mature fowls—except the broody hens—seem to have a rooted aversion to youngsters, and will invariably damage them, either accidentally or intentionally. As a matter of fact, I never like to run pullets with hens, although both kinds may be in full lay, unless they are being kept on a practically free range and the pullets can get away by themselves.

In the case of allowing chickens to use the same runs as adult stock there is another objection—when the food is put down, no matter how many small vessels may be used and spread about, there is little chance of the young birds getting a meal. Of course, there are such appliances as feeding cages, made of laths, between which chickens can pass to a trough; but while they may enable them to get their food, it frequently happens that the old birds prevent the chickens entering the cages, or they so scare them that the youngsters cannot settle down to eat their food in peace. Much better, therefore, keep the rearing ground for the use of chickens only, so that they can be managed and fed for growth. Young fowls at best are generally timid little creatures; and although they can, and do, get accustomed to their regular attendant, they always thrive better when they are not likely to be chased about or worried by their elders.

Increasing the Accommodation

There comes a time in the brooding process when the hen must be parted from her family, or the chickens from the heat of the artificial rearer. At what age this should happen will depend largely upon the season and the state of the birds themselves; and when I mention that it can take place as early as four weeks and as late as ten, it will be seen that no date can be fixed. For instance, during late spring or in summer, I have cut off the heat, so to speak, at the four-week stage when rearing on the battery system with wire floors, subsequently transferring the chickens to arks with sack-covered slats. On the other hand, in winter, I have kept them on the hover system until they have been about ten weeks old, taking care, however, to reduce the temperature of the sleeping compartment, as I mentioned previously in this chapter. As a rule, though, in artificial rearing, chickens will require heat until they are fairly well feathered; at any rate, until they have passed out of their baby fluff stage. And, unless the season is such that the nights are fairly warm, they will require hardening off in their brooders before being housed without heat. That is, rarely can they, with safety, be transferred directly from a heated chamber to the night quarters in the open. It is because of this, and to avoid the risk of chilling, that many battery brooders require cooling-off or hardening cages as part of the system.

The time for making the change in natural rearing will depend in no small degree upon the hen herself. In springtime and early summer—when hen rearing is mostly in vogue—the broody will probably want to leave the chickens when they are about six weeks old. This is particularly the case if she is of good laying stock and has been allowed her liberty with them, or kept cooped most of the time and permitted to eat freely of the special food put down for the youngsters. She will in all likelihood come into lay again at six weeks—I have had hens which started within four weeks of hatching their broods. Granted it may not then be convenient or even advisable to take the hen away; but, as a rule, when she does recommence laying she pays scant attention to the

chickens. They will not hesitate to seek her warmth at night should they require it; but it is preferable to return her to her old quarters when she comes into lay rather than to force her to continue brooding. In this case, provided the weather is suitable for separation, the youngsters may safely be allowed to use the coop in which they have been accustomed to sleep, as long as there is room in it to enable them to spread out. This is a point which wants watching, because they must not be allowed to sleep packed like preserved pilchards, to become so overheated that they stand a good chance of catching a cold as soon as they are liberated into the fresh air.

When the chickens eventually outgrow their first night-quarters, whether coop or small unit outdoor brooder, they should be transferred to a rearing house, although it has been said that it is better to put them into the one they will occupy when fully furnished. This latter plan, nevertheless, is seldom possible to carry out when one is poultry-farming; neither is it desirable, because it would mean sinking capital unnecessarily, considering that the adult quarters must be stocked with layers. Hence, either arks or fold units should be provided for the birds in their growing stages, as these appliances can easily be made at home, or purchased for a small sum, while they can be always used on the section that is set aside specially as the rearing ground. When this change of quarters is made in winter, it may be necessary not only to cover the slatted floor of the night chamber with straw or sacks, but to hang a curtain of gunny or hessian inside, or even to suspend a storm lantern in it for the first few nights. Some such protection may be advisable, although it is much better to harden the birds before they are transferred.

In any case, the coop or rearer in which they have spent the first few weeks of their lives must be entirely removed from the run they are occupying; otherwise trouble will result. If it be left open, even though other sleeping quarters be provided for them, the chickens will endeavour to get into it at night, crowding on each other, while if closed they will sleep on the roof. I had this forcibly brought to my notice when I was young, since, having carelessly omitted to close one of the coops, I found the chickens packed into it to such an extent that more than half of them were suffocated. On two or three occasions, also, I have found the birds huddling together on the very spot on which the coop, or rearer, has stood. To obviate these troubles, I always transfer chickens to entirely fresh ground when putting them into their rearing houses, and, moreover, take care to see that, when using "growers' arks," the birds are put to bed. They rarely go to roost of their own accord at the beginning, and it invariably means that they have to be taken up in twos or threes to their proper quarters. It requires patience—but so does the whole management of young stock. To prevent their seeking shelter under the slatted floor it is advisable to fix some 1 in. mesh wire-netting temporarily around the open spaces at the bottom of the ark. This, of course, is not required when the folding system is in use, but it is

FIG. 126. NATURAL REARING

A section of the chicken field at a well-known poultry farm. Double-compartment coops of the ark type, each suitable for a hen and a full brood of chicks. They make excellent night quarters for young birds during their early growing stages

necessary to see that the youngsters sleep in the proper place and not on the ground.

When Changing the Houses

One thing that must be avoided, and particularly when chickens are drafted from large flock brooders to colony rearing houses in the early season, is overcrowding. They will huddle together at night at almost any stage; but, although the temperature of the hovers has been considerably lowered or the heat altogether done away with before they leave their first quarters, the change to the unheated ark or colony house seems to be too much for them at first, while the strangeness of it also makes them rather nervous. Some seek a corner; others follow. And thus there will be those which get trampled on and killed, and others which become overheated and likely subjects for chills.

I have mentioned rounding off the corners of the brooder compartments when chickens are being ground-reared; hence, if this method is adopted in colony houses, bundles of straw could be put into the corners at first. On the other hand, if perches are provided, then a poultry-farmer of my acquaintance says it is an excellent plan to improvise a hover by fastening some sacking over them, so that the chickens can sleep under the sacking, which will conserve their heat and turn the house into a cool brooder. This temporary arrangement is used for a fortnight, by which time the birds should be quite accustomed to their new quarters. I have certainly not tried that plan, much preferring the old-fashioned Sussex chicken ark, and putting straw over the slatted floor for the first few days. This makes it easy for me, when visiting the houses within an hour of putting the youngsters in, to see that they are not huddling together too closely, and to spread them out if necessary, which often happens during the fortnight following their transfer.

Perhaps the novice who is rearing on small lines may feel that all these matters are hardly suitable for him, and that he can scarcely be expected to provide an ark or a colony house for his few chickens. That may be so; but he cannot hope to rear them to the laying stage without making some provision for their increasing size. In his case, however, he will probably find that the double compartment hen-coop can be converted into handy quarters for the pullets he is keeping, the cockerels among the brood having been disposed of for table. It can be done by substituting a slatted floor for the solid bottom, and raising the coop about two bricks high. If necessary the whole front of the coop can be removed, so as to ensure plenty of fresh air; but there must be a hood or bonnet arrangement along the top to prevent rain soaking the chickens while they roost. Some of these double compartment coops I am still using have their slatted as well as solid floors, and the former are simply made of plasterer's laths, $\frac{1}{2}$ in. or more apart, nailed on to stout frames so that they can fit inside. There are two for each coop, which ensures their being readily taken out and kept clean. Such a house makes quite suitable quarters for a few growers; and it can sometimes be utilized for pullets until they are advanced to occupy the laying house.

Allowing Chickens to Roost

Then there is the question of allowing the chickens to perch at night. Some poultry-keepers are so scared by the bogey of crooked breasts that they keep their

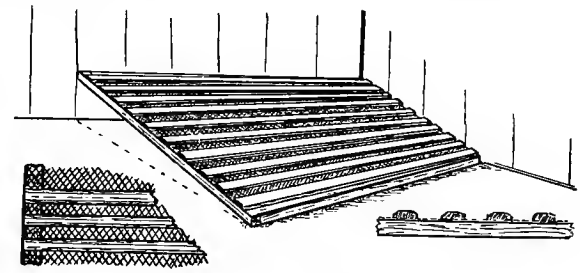


FIG. 127. PERCHES FOR CHICKENS

Chickens a mooth old can be taught to roost by means of a slatted platform in their brooder house. Make a 6 ft. by 2 ft. frame of 1 in. by 1 in. strips, braced down the middle and at the corners; cover it with 1 in. mesh netting, and fix narrow perches across it, as shown. Put it in the corner of the house, one side being about 6 in. above the floor to give it a gentle slope. As the chickens become accustomed to it, raise the front of the frame gradually until the platform is level. The open end—and subsequently the front—must be protected to prevent chickens getting under it. Many chicken troubles will be avoided if the birds are taught to roost early, while still in the brooder house

birds on the ground until they are big enough to be killed for table; or at least for the first three to four months. And yet it does not prevent crooked breasts, because if the weakness is there—more often than not it is due to constitutional weakness rather than to faulty feeding—the bone will become dented or crooked whether the birds sleep on a feather bed or on a broomstick. I let my chickens perch as soon as they are off brooder heat or getting along without the hen; in fact, I encourage them to do so almost from the first, when with hens. Perching is a natural instinct; and when young birds are strong enough to raise their bodies from the ground, then assuredly will they perch. It may be on the edge of food trough or water pan, on the ridge of their coop, on an open door, the branch of a bush, the handle of a barrow, the bar of a fence, anywhere; but perch they will, as long as they can balance in a fairly comfortable manner and be above ground. Consequently, as they insist upon doing it during the daytime in the open air, why deprive them of it at night when they may

perhaps not be in such fresh air? Let them perch, if for no other reason than that it is their nature.

As a matter of fact, the perching of chickens is not understood by many who rear them. The sooner the birds are perching the less danger there is of their crowding. Every chicken on the perch means better conditions for those on the ground; and the provision of outdoor perches induces the youngsters to keep in the air rather than to have to resort to their sleeping quarters when they wish to rest up during the day. When winter chickens are being brooded indoors on the ground, even though they be provided with sun balconies, it is more than ever necessary that they are permitted to roost at an early age; and no trouble from huddling need be feared when they take to the perches. In this case a slatted platform of suitable size should be provided for them, fixed an inch or less over 1 in. mesh wire-netting some six inches from the floor. It will require surrounding with wire-netting at first to prevent the chicks getting underneath; and it may be found necessary to fit a run-up to it. By such an arrangement I have had chicks roosting at five weeks in the brooder house; and, because many of them occupy the perches during the day, they give the others more chance to eat and drink, and thus reduce the congestion of floor space. In addition to this, the chicks which are roosting are peaceful and not seeking mischief. Should a bird desire to rest, or to find a refuge from an attack by others, the perches serve their purpose. Therefore, proper perching facilities may often prove to be an effective means for the prevention of cannibalism, which is more of a problem in connexion with winter brooding, because of the closer confinement.

Now, since some perches are better than others, see to the formation of the roost rather than bother about the age at which the birds should rest above ground; and go to the trouble of showing any chickens which will not follow Nature's way—some are obstinate little creatures—how to do it. The roost must be of a kind they can grip with their toes, but in such a way that they can balance their bodies. A shelf has been suggested; it is as bad as the solid floor. In my experience the best is a platform of slats, or, failing it, then perches of about $\frac{3}{4}$ in. diameter and almost round on top, or with the sharp edges planed off.

Put the roosts out of severe draughts, and where they are accessible—not more than six inches from the floor to begin with. If they are so placed that the birds have to jump down when leaving them—as, for instance, when perches are fitted in a colony house—it is advisable to see that there is plenty of room for them to alight with ease, and also to ensure their landing on something which gives to their feet. When the perches are close to the ground it is seldom that chickens use their wings when getting off; they jump down. Consequently, if they have to drop on to a floor which has no spring in it, they are very apt to get a jar to their system, which may be so severe as to cause leg trouble or something worse. Therefore, unless the floor is of turf or loose earth, it is as well to put down a layer of peat moss litter or some similar material. However, let the chickens roost, because by sleeping on perches or a slatted floor there is little fear of their becoming overheated.

Distinguishing the Sex of Chickens

Another matter in connexion with the rearing of fowls concerns the separation of the cockerels from the pullets at an early age, because in some breeds, no matter to what stage the cockerels may be grown, they are seldom profitable to sell for table. Hence, while all of them cannot possibly be developed for stock purposes, the vast majority are better out of the way at the earliest possible moment. Old experienced hands at chicken rearing find no great difficulty in picking them out among the pure breeds during the first two or three weeks after hatching, and certainly before the birds are off brooder heat; but it is not a simple matter for the beginner to do so, and many a one does not attempt it before the crowing of the cockerels makes it certain. In this case, it is often left until, as one might say, the birds are big enough to be eaten; but by that time they may have cost more to feed than the price they will realize on the market. They are then sold at a loss, but the loss would have been considerably less had they been killed before they left the coop or artificial brooder.

The commercial egg-farmer who keeps his stock entirely for laying does not want to rear cockerels for a day longer than he can help; he gets rid of them so that he can concentrate on the pullets. Of course, when one is breeding to pedigree the cockerels are retained, at any rate many of them are, because they may be quite as valuable as, or even more so than, the pullets. But the pedigree breeder knows how essential it is to separate cockerels from pullets at an early age; it enables the chickens to feather up at a more natural rate, and prevents both male and female being too precocious, in which case the cockerels would be furnished while still of stunted growth and looking "old-fashioned," and the pullets would commence to lay at a very youthful age and, therefore, produce quite undersized eggs which would scarcely be marketable.

The earliest age at which the beginner should attempt to sort through his pure-bred chickens for sex, with any hope of making a fair percentage of certainties, is at four weeks; but he must be prepared for doubtfuls. At a month, then, provided the

chickens which are being examined are of the same brood and have made steady progress, those of both light and heavy (general-purpose) breeds begin to display characteristic sex differences. Thus, in the former—such breeds as Leghorns, Minorcas, and Anconas—the comb of the cockerel, small though it be, is not so small as that of the pullet; it shows slightly more colour, and the points are firm and upright rather than soft and inclined to droop. His tail, too, the true tail feathering, is in a more advanced state; but in other respects there is little difference in the plumage. The doubtful will be the cockerel which has been hatched from what is known in exhibition circles as a "pullet" breeder—which I have explained in Chapter IV—because his comb will probably be weak and it may never be upright at any age.

Appearance at Different Ages

In the heavy or general-purpose breeds at a month, breeds like Rhode Island Reds, Wyandottes, and Sussex, the pullet shows her back, breast, thigh and wing feathers more distinctly, her tail is developing, and, generally, she is more presentable than the cockerel; he looks raw and gawky while she is smart in her first feathering. At this stage, also, the male chicken is nearer square shaped, more "cobby" than the female; he has thicker leg bones, and a stouter head, more round and thick generally.

A fortnight later there can be no mistaking the tail of the light breed cockerel, as it has lost its fluff, while the pullet's tail is somewhat stunted. In the heavy breeds it is the reverse, because the pullet's tail is quite visible while the cockerel's, although starting to grow, is mere fluff with scarcely a sign of a genuine feather. At eight weeks the cockerels of both kinds are stilty, apparently long-legged; their shank bones are stouter, and their combs and wattles will be more pronounced and red, these latter parts of the pullet being only just visible and of a yellow rather than a flushed tinge. The feathering at ten weeks is a point to note; the hackles on the neck and particularly the saddle of the cockerel—which part of the pullet's body is known as her cushion—are narrow and pointed while the pullet's neck-hackle and cushion have broad feathers with rounded ends. At three months old there should be no mistake as to which are males and which females in any of the popular breeds. As a rule pullet chickens show more feathers during the first three months than do cockerels. The males at about six weeks are usually taller than the females and develop their leg bones more quickly, while at about seven to eight weeks, when pullets are well nigh free of fluff, the cockerels will show bare patches on their shoulders, back, and wing bows.

Practically all through the growing stage the pullets are of neater appearance and more active in their movements than the cockerels, although the latter are almost invariably first at the food troughs. Such are, then, the signs for which to look in pure-bred chickens, but they are not, of course, those appearing on day-old birds. They should, nevertheless, assist the beginner to pick out the sexes as the various stages are reached; and if he has the gift of observation and a retentive memory—or, better than the latter, a note-book in which he keeps records—he should not find the sexing of his pure-bred chickens too difficult a matter after a little careful study. In cross breeding, and particularly in the crossing of a cock of any well-established light breed with hens of a general-purpose breed, the pullet progeny feather up well ahead of the cockerels. The light breeds are quick featherers compared with the others; hence, the female chickens of such a union follow the male parent in that respect, while the cockerels resemble their mothers. And, provided the breeds used to form the cross are pure bred, the sex of the chicks can be distinguished almost at hatching time—the pullet's wing feathers are quite distinct compared with those of the cockerel.

Sex-linked Chickens

On the other hand, if the rearer of laying stock goes in for sex-linked chickens—a matter I deal with fully in a later chapter—he can eliminate the cockerels from his broods as soon as the chicks are dried out after hatching. Briefly, it may be said that sex linkage, for plumage colour, consists of mating a "gold" cock with "silver" hens, or a black cock with barred or cuckoo-marked hens. In the former case all the pullet chicks will favour a shade of gold while the males will be silver; and from the other union the cockerels are barred and the pullets are black, the barring showing only as a slight patch on the back of the head, because the progeny will be practically black.

Concerning this sex linkage the beginner should note that day-old cockerels of black-barred and black-cuckoo unions show a white mark on their heads, varying in size from a spot to a blotch, while the pullet chicks have pure black heads. The same also applies when a cock of any colour (except blue and certain classes of white) is mated with barred or cuckoo hens—all the pullets have full black down while all the cockerels show the light head patch. Very occasionally a cockerel of the union (black-barred) is practically black-headed; but the down of such a bird is of a light shade. There may also be a dark brown cockerel, but he has a white spot on his head; or even a whole white cockerel; while I have known of a dark brown pullet being hatched, but she

does not show the white patch. Such faulty chicks, nevertheless, are rarely produced from the black-barred cross, and particularly when care is exercised in the selection of the parents, since both sires and dams must be pure bred.

In some gold-silver unions, too, there are occasional variations in the colour of the down which make the separation of the day-old chicks according to sex a somewhat puzzling matter for the novice. It is true that, as a general rule, birds with silver or white predominating in their down are cockerels and those with gold are pullets; but the depth of these two colours, or the extent of them on the body of the chick, depends upon the breeds which are mated together to form the link. Thus, for example, the Buff Plymouth Rock (male) mated with White Wyandotte (females) produces cream-coloured cockerel chicks (some with black ticking on their heads and wings) and light golden-brown pullets. The Rhode Island Red-White Wyandotte cockerel chicks are cream or white generally, with ticking on their necks and sometimes dark markings on their backs and wings, while the pullet chicks are of a medium gold, often with distinct dark brown markings on their heads, sides, and backs. The Rhode Island Red-Light Sussex cockerels are mostly cream coloured, and the pullets a dark shade of buff, while the Brown Leghorn and Light Sussex mated together for sex linkage produce almost white cockerels with a little black in different parts, and rich golden (verging on red) pullets, with chocolate-coloured striping on their sides and backs.

Variation in Colour and Markings

These sex-linked chicks naturally vary in their colouring and markings according to the variety (that is, the definite branch of the breed) of the male and the females which are mated in the breeding pen. Hence, although the black-red section of the gold group of male birds generally produce pullet chicks with more pronounced striping than is the case when buff or red males are the sires, the novice should choose as cockerels all chicks which show silver or white in their down, and, as pullets, those with gold. To put it plainly, in the gold-silver unions the male progeny favour the female parents for colouring, and vice versa. There would probably be less variation in the colouring and markings of the chickens if only one hen (silver) were mated with the gold cock, and both birds had been true bred for breed standard requirements. But so far I have not thought it worth while to experiment in that direction, because pen-mating for sex linking gives quite satisfactory results, while sex-linked pullets are used solely for egg production and not for stock purposes.

It may be as well to caution the novice that, in sex-linked breeding, he must not expect the progeny of any given union to furnish up in plumage with the same uniformity of colour and markings seen in pure-bred chickens of standard exhibition strains. Admittedly, in some of these crosses, in which the parents have been selected from prize stock, there is often a remarkable similarity among the silver cockerels and the gold pullets, while occasionally it is surprising how closely some of them, particularly the pullets, resemble pure-bred birds. This I found when breeding from Light Sussex hens and a Welsummer cock, many of these sex-linked pullets being difficult to distinguish from standard-bred Buff Sussex. However, I have probably written enough about sex-linked chicks to assist the novice in making an attempt to separate the cockerels from the pullets with some degree of certainty. He should complete the separation, if possible, before he has to find accommodation for the brood when it comes off brooder heat; that is, by such a time he should have eliminated the cockerels, so that the pullets can have the maximum of house room and range.

Sexing the chickens by any of these methods means that he must practise to make perfect. Perhaps the best way in which the beginner can learn is to ring all his chicks during the first season, according to whether they are, in his judgment, male or female; and then to take weekly notes of their appearance and development until they arrive at an age at which there cannot be the least doubt about their sex. It is a most interesting study, and can scarcely fail to be of great service for future broods.

The Sexing of Day-old Chicks

The most certain way of distinguishing the sex of pure-bred or cross-bred—other than sex-linked—chicks, in what is known as the day-old stage, is that which was discovered at the Imperial Livestock Experimental Station, Chiba, Japan, the originator being a practical poultry raiser. By this method an expert can tell, almost without failure, which are male and which are female chicks by examining them as soon as they are dry after hatching, or at any rate within twelve hours from the time they leave the shell, so that it is possible for the cockerels to be disposed of immediately they have passed through his hands. For the commercial poultry-farmer who goes in for pure breeds of the light and non-sitting class for egg production, it has a decided advantage in enabling him to rear his usual quantity of pullets in much less brooder space and, of course, at a saving in food. The initial outlay for the chicks—if he buys in, as many a one does, instead of incubating eggs from his own stock—is certainly higher, since the guaranteed pure-bred day-old pullets cost probably

double the price of mixed day-old chicks, that is, those which are sold without any examination. The sexing of chicks at such a very early age, by what is known as the Japanese method, has been practised in Canada and the United States of America for some considerable time, and until the latter part of 1934 it was practically a monopoly of Japanese experts. At least, they only were employed for the purpose in England; but there are now several poultry authorities in this country who, by closely studying the subject and constantly practising, are proficient at it.

For some reason the sexing of day-old chicks did not attract a great deal of attention among our poultry-keepers when it was first made public; and this may have been because many practical rearers can, and do, separate their chicks before the birds are off brooder heat, and are satisfied that this is soon enough for their purpose. So, indeed, it may be, where the intention is to rear the cockerels for market or stock. Nevertheless, since Leghorn cockerels can seldom be marketed at a profit, it is decidedly beneficial to get rid of them before they are put into the brooder. It must be admitted that, since this method of sexing chicks was first introduced into this country —and pronounced by one investigator as being too slow in application to have any commercial value— great progress has been made; and at the World Poultry Congress in Rome, in 1933, the demonstrations given by Japanese experts were proof of this. There are now those who can handle up to 800 chicks an hour with an accuracy of 96 per cent, while to such an extent is it being practised in our country that, I understand, something like two million chicks were sexed by this new method in 1935.

Contrary to what may be thought, there is no secret about it; but, while the actual process is simple, it is a highly skilled job which requires training and concentration. To become proficient at it, one has to possess not only nimble fingers but very keen eyesight, while a great amount of concentration and patience is required. There has to be a natural aptitude for such work; and, as a Canadian expert remarked, an insatiable desire to practise on every available opportunity.

The Method of Examination

The chick to be examined is held firmly in the palm of the left hand, on its back, with its head between the first and second fingers, and in such a way as to get a clear view of the bird's *cloaca*, i.e. vent. The thumb is pressed gently on the *cloaca* to ensure the lower part of the bowel being empty; and then, with forefinger and thumb of the right hand, gentle pressure is exerted on the *sphincter* (muscle of the *cloaca*) to open the ventral side of it, for this is the one to be examined. Inside it are folds or wrinkles, and on the second one—the first fold is just inside the *cloaca* almost on the edge of the exposed part—is a very rudimentary vestige of a copulatory organ. This is best seen as soon as the chick has dried, after emerging from the shell, while the examination must take place before the bird is twenty-four hours old. In the male chick this organ, a mere pin point, generally appears as an eminence (standing up from the fold) with a flattened top, while in the female it is perfectly round and smooth.

This examination looks quite simple; but that is the only simple part about it. To the untrained eye, the male organ appears like a secondary fold, while there are chicks which puzzle the expert—those in which there is no perceptible organ, and pullets which are similar to cockerels. It will thus be seen that some difficulty is likely to be experienced in selecting the sex according to the shape of the organ. As I mention in Chapter V, when dealing with chick embryology, up to a certain period of incubation, both sexes have an equal development of the genital organ. But what the Japanese investigators have noted particularly is that, after that time (about the seventh day), in the majority of females, the organ begins to recede and has disappeared at hatching. There is, nevertheless, a fairly large percentage of cases in which the female chick retains a perceptible organ when hatched; and it is this which makes sexing a very difficult matter in the hands of other than an expert.

The Japanese experts certainly deserve praise for the very close study they have given to the subject, because there is no doubt that by their method the sexes of pure-bred chicks can be distinguished before the day-old stage with as much success as can be achieved with the English method of sex linking. It can be imagined, of course, that, whereas the sex of the sex-linked chicken can be told when the birds are on the ground, the Japanese method necessitates each one being handled. It will be seen that very close study is necessary, even for those who possess keen eyesight and nimble fingers, and that guidance under qualified experts is very desirable throughout the whole course of that study. Moreover, without constant reference to a textbook, it is almost impossible for the student to classify correctly the various formations of the folds.

Now, while the chicks are quite safe when being examined by an expert, there is the possibility of the beginner holding a bird so tightly as to suffocate it, while by attempting to open the *sphincter* he is likely to cause rupture of the internal organs, or burst the yolk sac. It is very necessary to become proficient at handling the chicks and opening the *cloaca* before any

attempt is made to ascertain the sex, because unless this is correctly done, the rudimentary organ cannot possibly be observed. Hence, the great importance of this part of the work, finger manipulation, is stressed by specialists. This method of sex determination is undoubtedly of value to hatcherymen and commercial poultry-farmers who deal in and keep pure breeds for egg production; but the average poultry-keeper who breeds his own stock will have little use for it.

Marking and Ringing Chickens

Before concluding this chapter on brooding and rearing there are one or two other points which may be mentioned. One concerns marking the chickens in such a way that those of different strains (i.e. families) can be distinguished. It perhaps concerns the pedigree breeder rather than the ordinary poultry-keeper; but even the latter may find it beneficial, when he is starting to form a strain or purchasing chickens to rear with those from his own stock. In such cases it is imperative to have some means of identification. When chickens are being hen-reared it is not a difficult matter to allocate each batch to a different hen; and in these circumstances the chickens need not be marked until they are about due for separation from her, unless there is any likelihood of their getting mixed with others. When being artificially hatched or reared, however, and special small incubators are not employed for hatching, the eggs should be placed in pedigree trays, or each in its own muslin bag, and the chick marked as soon as it is out, and prior to its being transferred to the brooder. Care must be observed in this latter case that the birds are not chilled; but there will be little fear of this occurring if the temperature of the incubator room is correct, and draughts are avoided.

There are various ways of marking chickens. Some poultrymen use differently coloured dyes, although one will do, unless many distinctions have to be made, since different parts of the body can be marked. Thus a small spot of it may be applied by a camel-hair pencil to the head, the chest, the back, either side, or the rear fluff as the case may require, the whole of the chickens of each strain being marked in the same way. Another method is toe-punching, a hole being made in one part of the web of the foot by means of a small clip or pincers-shaped instrument known as a toe-puncher. A third is to put a thin spiral ring or flat coloured band of celluloid on the right or left leg, using different colours if necessary. This is the system I adopt; but it is most essential to see that the ring or band is changed for an adult ring before it becomes embedded in the leg as the chicken increases its growth. Should this unfortunately occur, it must be immediately taken off and the leg and foot massaged, using a few drops of olive oil; and another ring must not be put on for two or three weeks.

Some poultry-keepers object to the use of these rings or bands on the ground that they inconvenience the birds and may be the means of their getting caught up in wire-netting or long grass. I have marked my chickens in such a way for very many years, but never has one of them been inconvenienced or injured by being so adorned. Most of the rings and bands are of bright colour; hence, unless the youngsters have to paddle about in the mud—which is detrimental to their health—they can be readily seen.

The Appearance of Pure-bred Chicks

The only other subject on which it is necessary to touch while treating of rearing—beyond feeding, which is dealt with in the following chapter—is the appearance of pure-bred chickens in their "nest feathering." In practically every breed the young do not appear in their proper or standard colours until they have developed their first full plumage or have become "furnished." For instance, the chickens of black fowls, the progeny of stock which is correctly mated for colour points, almost invariably hatch out with white in their down, and sometimes more white than black. In fact, an all-black day-old chick will seldom furnish of a brilliant black; more often than not there will be red or a gold tinge in some part of its plumage. The same remark applies to black-and-white breeds, such as Anconas and Houdans, although in this case the adult plumage is black with small white tickings or spanglings. They are hatched of a more decided black and white, and in Houdans, the white is frequently in excess of the black.

Then take white varieties. Most novices naturally imagine that, no matter of what breed the chickens may be, they must be pure white. And yet this is seldom the case. There is a difference in the shades; but if a beginner were to set eggs of two or three breeds under the one hen or in the same incubator, with the idea of separating the day-old chicks by colour alone into their respective breeds, he would find it somewhat difficult. In the first place chickens from white fowls seldom hatch out pure white, but rather, according to their breed, of various shades of yellow, of a blue tinge, and even a grey. White Sussex, from birds which have white skin and legs, as well as white plumage, sometimes possess a more decided yellow cast in their down than White Wyandotte chickens, whose parents have yellow skin and legs. Then, too, there is a distinct blue tinge in the first feathering of White Bresse chickens. But, if the progeny is from well-bred stock, there is no question that the ultimate feathering of the chickens, be they

yellow or blue to begin with, will be similar to that of their sires and dams.

Barred fowls, such as Plymouth Rocks, are never so marked as day-olds, and particularly if the markings of the parents are close and well defined. They are practically black to begin with; and it is some time before the markings commence to break through, first on the shoulders, then on the wings and breast. Buff Orpingtons, too, vary considerably, some being very pale, almost yellow, and others of a dark shade verging on red. Rhode Island Reds, perhaps, vary least of all, if colour has been the object when the birds were mated; but some of them may show black or white in places, if care be not taken when the stock is selected. Speckled varieties, such as the Speckled Sussex, which are of three colours, are generally almost white when hatched, with some buff or brown here and there. Blue varieties, which should be of a self colour or laced when furnished, often produce black or smoke-coloured chickens, although these off colours do not furnish blue. The chickens of brown and black-red varieties are certainly brown but their only marking in the early stage is a broad stripe of dark brown down the back from head to tail. It will thus be seen that colour is by no means a safe guide for the novice; and until he is well versed in such matters —as he can be, by keeping a book and jotting down the monthly change of plumage—he should look rather for type of body to assist him.

In most breeds also, leg colour sometimes puzzles the beginner. Black legs often start by being black and white, and yellow ones either willow or dusky, while chickens of white-legged breeds are frequently hatched with a tinge of blue or yellow on their legs. Then, again, the young of feather-legged breeds are generally hatched with a fringe of down on those parts, but some chickens of clean legged birds also show traces of feathering on their legs. These matters, mayhap, are more for the breeder of standard than utility stock; and yet, when pure-bred fowls are kept for utility purposes, for laying rather than for table, they should in most points resemble the breed whose name they bear. Otherwise there would be little purpose in having so many different breeds as exist to-day.

Suitable Litter

One further rather important point in connexion with the brooding of chickens when they are being ground-reared is the nature of the litter for the floors of the coops, the small artificial hovers, and the brooding houses. Coops are generally used for sleeping purposes only, although the double compartment style does provide enough space for scratching exercise. For them, therefore, a mixture of chaff and well-sifted earth will be found suitable. Earth is not only a good deodorizer and a useful material to fix the droppings, but it holds the chaff together and prevents the latter being blown about. It can always be procured in abundance in the country in a fresh condition, while the much-abused mole generally gives a sufficient supply throughout the rearing season —after rain the hillocks soon dry, and the earth of which they are composed is naturally pure and fine. Hay is not suitable, even for the actual bed on which the chicks are brooded by the hen, because, while it does hold the warmth, it soon becomes matted and fouled, and, moreover, it harbours lice. Chaff is generally used alone in small hovers; but it is so light that it frequently gets scratched away and forces the chickens to sleep on the boarded floor. It can be mixed with earth, although an entirely different material, such as granulated peat moss or cedar waste, is preferable. I have at times used coarse sawdust, and it has proved serviceable, particularly if the lamp is not exposed.

Straw—cavings for preference—chopped or cut into 1 in. lengths, makes good bedding; and if chickens are properly fed they are not likely to eat it—or chaff, or sawdust. There is sometimes that possibility, but generally only when the chickens are provided with wet mash so badly mixed that large pieces of it can be dragged out of the trough. There is little fear of their mistaking it for food if chopped straw is spread over the whole floor of the cabin or brooder house. Some brooder house floors consist of earth, while others are of wood. In either they must be littered, if merely to prevent their getting unduly fouled. In some parts of the country chopped fern or bracken (dead) is used, and so are autumn leaves, dry; but there is perhaps nothing better than coarse river sand, with straw chaff on top. Loose earth is apt to become soon dried out and dusty, particularly when on a wooden floor combined with the heat of the brooder house; and that means it must be very frequently renewed.

There are probably other kinds of suitable litter; but whichever is used, in coop, small rearer, or brooder house, it is essential to keep it reasonably free of excrement, and to shake it up occasionally to obviate any possibility of its becoming caked. The chicken man cannot be too careful in seeing that the night quarters are kept clean and sweet. As a final word on bedding, let me caution him to avoid mouldy straw or chaff, because dust from such materials which is inhaled by the birds is apt to set up a disease which some folk term "brooder pneumonia," and which is fatal.

CHAPTER VII

THE FEEDING AND DEVELOPMENT OF CHICKENS

AMONG the thousands of poultry-keepers who rear sound stock year after year, it is perhaps not too much to say that scarcely any two of them follow an absolutely identical routine. But, divergent as are the systems in vogue, when they are carefully sifted through they can be placed under two simple headings —accommodation and food. They cover the whole ground. Therefore, granted the possession of the right kind of chickens to begin with, successful rearing depends upon nothing more than providing the birds with adequate accommodation and good food. These essentials appear easy enough to carry out; and so, indeed, they are, in experienced hands. Nevertheless, chick rearing is not quite as simple as it looks; in truth, it may well be reckoned as one of the branches of poultry-farming which demand extra care, because it is certainly not the easiest task that has to be undertaken in connexion with the business. Still, it can be mastered by the exercise of common sense, and by paying special regard to the most minute detail.

The novice who would become proficient must be prepared to give undivided attention to it. There must be the right kind of chickens; and by this I mean that not only must the birds be "hatched strong" but, when artificial methods are being used, they must be very carefully transferred from the incubator to the brooder. So many chicks are chilled before they ever reach the hover that they stand very little chance of developing, and generally perish within the first few days. The novice should always remember that chicks are never more susceptible to chilling than immediately after they are hatched. Hence the need for great care being exercised when they are taken from the incubator, in the packing of them for conveyance to the hover, in transport, and in the proper preparing of the brooder against their reception. Those are the first steps in their development.

In the preceding chapter I have dealt fully with accommodation as far as the actual brooding stage is concerned, and I have shown how it can be provided in a number of different ways. It means, in few words, allowing the chicks as much fresh air as is possible and compatible with the avoidance of draughts and the provision of warmth. Take the matter of adequate warmth; the birds must be kept warm, and every brooder is designed to secure this end. And yet innumerable chickens are lost each season through failure to make and maintain this apparently simple provision—chilling is one of the commonest causes of chick mortality. Then, regarding fresh air; as long as the youngsters are provided with warmth, and not exposed to draughts, they can scarcely have too much fresh air. But scores of brooding losses are due to a failure to achieve this object. It is not necessary for one to be an expert on ventilation to understand that fresh air, fresh enough for the well-being of chickens, can be obtained without exposing them to severe draughts; and brooder house management is not for the person who imagines that no air is fresh unless it comes as a chilly blast.

At one time it was considered that exercise was absolutely essential for successful chick rearing in the earliest stages, and that without it the birds could not thrive. It was insisted that even under modern brooding conditions—which may well mean that chickens have to be confined indoors for as long as three or four weeks—they depended a great deal for their necessary exercise upon the work of scratching for their grain, while the correct digestion of that food depended upon exercise of such a nature. So it might have been, and so indeed it is, under certain systems of rearing. And yet, it may be as well to remember that there is not the slightest opportunity for this kind of exercise when chicks are being kept under the still more modern brooding conditions of wire floors, whether they are being brought up in batteries or in single-tier wire-floor rearers.

For some years now I have maintained that it is not absolutely imperative for the health and strength of chickens to provide them with the means of scratching through litter for grain or other comestibles. Admittedly, it is a natural instinct, and, at certain seasons, my chickens are permitted freely to indulge in it. There can be no doubt that it is of considerable benefit for birds which enjoy a wide range, while, moreover, it assists in no small degree in keeping food costs to the minimum. But chickens can and do thrive without it. I was among the first to advocate that their grain rations might safely be supplied to them from a trough. And, to digress for a moment, the very latest method of housing laying stock in single cages is proving, by the excellent results which are being obtained, that egg production is not being affected by idleness, as far as numbers are concerned. It is very satisfactory to know that nutrition specialists have confirmed by research what field workers have learnt by practical experience.

That the rearing of chickens on wire floors does

very considerably reduce exercise is beyond question; but their digestions do not suffer when they are correctly managed. Strong-limbed and sturdy birds with good appetites can be reared by this system, as I have proved on my own farm; and, although they have been deprived of scratching exercise during the first weeks of their lives, their muscles are not so flabby or their bones so weak that they cannot use their legs and feet with as much force as other birds which have been reared on earth runs. For them, it is a matter of nutrition—the process of promoting the growth of animal bodies. It depends upon feeding, which brings us to the subject in hand.

No Ideal Diet for All Cases

There are stock raisers of my acquaintance who believe implicitly in the proverb, "It is the eye of the master that fattens the ox." The best suggestion I can make to those poultry-keepers who would succeed at rearing chickens is to feed with the eye as well as the hand. Perhaps because I take time over my own meals, I take time when feeding my stock. Nothing is gained, when chickens are being fed, by making a rushed job of it. The feeder who finds time to run an eye over the birds when they are at the troughs or, mayhap, searching for grain which has been scattered for them, will know more of their requirements and, consequently, of their condition and how to adjust their diet if necessary, than the one who feeds chickens for no other reason than that they must be fed. It is a much better paying proposition to rear few rather than many chickens, if the many have to be hurriedly fed because no time can be spared to watch them as they feed.

Good feeding from the beginning of a chick's life does a great deal to develop the likely bird; bad feeding prevents proper growth and feathering. Good feeding means providing the bird with sound food, and combining the giving of it with good management —suitable food wisely administered. Poultry-keepers who are careless in their methods, who do things in a slap-dash manner, or go about their work in a purely mechanical way, will never make a success of raising live-stock, and certainly not of chick feeding. It may be that there is a knack in chick rearing which some people find difficult to acquire, and that not everyone has "hen-sense"—the instinct which enables us to know when things are not quite right before they are apparent in the ordinary way. I am well aware that the subject is not as easy as many others, because my advice is frequently sought in it. But the novice need not despair of becoming successful; it is within the reach of all who care to make a study of it.

A well-known authority once remarked that it has never yet been agreed what is the ideal diet for chick rearing. It is true that the opinions of successful poultrymen are contradictory on the matter; but this is simply because there cannot possibly be an ideal diet to suit all circumstances. One cannot lay down any hard-and-fast rule as to the best method of feeding for use on all occasions. Feeding has to be adjusted to suit the conditions and systems under which the chickens are being reared. The best guide one can possibly have as to the value of a rearing diet is the results which are obtained from its use. Personally, I am satisfied with my own methods, as they have been gradually evolved to suit the particular systems of rearing that are employed. There are others, no doubt quite as good. But if the suggestions made in this chapter are adopted as far as they can be applied to the varying conditions, there is no reason why thoroughly satisfactory results should not be achieved with rearable birds, provided always the accommodation is right—there must be proper accommodation.

As there are different methods of brooding chickens, according to whether they are in small clutches, large flocks or batteries, so must the feeding systems vary. What answers well enough for the few may not suit the many; old-fashioned ways in the latter case are generally too laborious and perhaps unprofitable. Contradictory as are the opinions about the feeding of chickens, on one small point there appears to be general agreement—they must not be fed immediately they are hatched, even though, while they are in the nursery or the incubator drawer, they may start picking about and give the novice the impression that they are hungry. No attempt should be made to feed the birds until they have settled down in the brooder or under the hen. In all probability they would not eat were food offered to them. And this reminds me that there should be no coaxing the youngsters to eat; when the meal is put down they should take to the food as, we are told, a duck takes to water. All that is necessary is to place before them food which they can reach with ease, and of a nature that can be readily digested. They will get on with their business, if they are strong; and should they be weakly, it will not be worth attempting to rear them. They know how to eat as soon as they can stand.

When to Start Feeding

Just when chicks should get their first meal and of what it should consist are matters which start the differences of opinion. Some poultry-keepers place grit and water before them as soon as they are put into the brooder, while, even in these enlightened times, there are those who advocate the very ancient —and very stupid—method of cramming a peppercorn down the throat of the newly hatched chick, to act, they declare, as a preventive of gapes! There is no

need to feed chicks until they are thirty-six hours old, and they do not then require grit or peppercorns, while they should be permitted to eat before they are allowed to drink.

As I mentioned in Chapter V, previous to the normally healthy bird leaving its shell, the yolk is drawn into its body; and this absorbed yolk serves to supply the chick with sustenance for a period of from twenty-four to thirty hours after it has hatched out. It may here be remarked that if the yolk is not absorbed at hatching time, i.e. when the bird leaves its shell, or if, when the chick has dried out, its abdomen is abnormally swollen and puffy, or its vent is in any way "gummed," it will save the attendant much anxiety to kill the chick rather than attempt to rear it. Birds exhibiting these symptoms rarely reach maturity, even when considerable care is taken of them; hence it is a waste of time and food to let them drag out a miserable existence. Unless they are separated immediately and brooded quite apart from the remainder, they will be in the way of healthy chickens; they almost invariably get trampled on, and their mangled bodies will generally be found under the hover buried in the litter. I once went to no end of trouble, as an experiment, in an attempt to rear such birds to maturity, putting them into a special hover and afterwards assigning special quarters to them; but, although I succeeded in keeping some of them alive until they were almost six months old, their unsatisfactory condition forced me to end their days. Hence, although the novice will undoubtedly find it a most difficult matter at this very early stage to differentiate between the strong and the weak by the appearance of their abdomens, he should certainly kill at once any chick which may not have completely drawn the yolk into its body.

To return to the question of the first meal, however; some poultrymen withhold food until the chick is forty-eight hours old, while a few extend the starvation period to seventy-two hours, as they maintain that strongly-hatched birds are the better for such a rest —from the time they actually hatch out—and that it induces them to start with an appetite and then to take their food properly. But as thirty hours is the limit of sustenance obtainable from the drawn-up yolk, I find an extra six hours or so is sufficient in which to let them work up an appetite which can be satisfied in a normal way. Moreover, a day allows ample time for the chicks to become thoroughly dry, for the poultry-raiser on a large scale to get them transferred to the brooders, and for the birds themselves to steady down after the excitement.

A lot of digestive trouble can be caused by unduly delaying the first meal, because, no matter how scanty it may be, the chicks are apt to gorge when it is put down, while there is also a fear that when hunger gets the upper hand some of the most forward of the birds will commence eating their litter—which is not good for them. Keen observers of chickens are well aware that some youngsters begin picking about almost as soon as they are dry; and while this may not be a sign that they are hungry, it certainly indicates that any considerable delay in providing them with food would be risky. I think it will be agreed that probably the most anxious time in ground rearing by artificial means is that which elapses between putting the chicks under the hovers until they get their first meal. For this reason I delay the transfer from the incubator as long as possible and always endeavour to put the chicks into their brooders towards evening, so that they can be fed very early the next day.

Special Attention Necessary

Newly-hatched chicks are particularly nervous creatures when they are deprived of the hen; and even though they will be perky enough after quite a long journey, packed closely together in a hay-lined travelling box, they are very easily startled when once they have been put under the hovers. At any rate, that is so for the first few nights. Any sudden noise is apt to make them scatter in all directions away from the heat; and unless they are guarded in a manner I have suggested to keep them within the warm zone, they may very easily lose their way back in the dark and thus huddle together in a corner and suffer in consequence. One cannot be too quiet and careful when attending to chickens which are being artificially brooded, whether they are on the ground or in batteries; and particularly is this necessary until they have become thoroughly accustomed to this mode of living. Perhaps it is that chickens are more nervous when in large flocks than when in single broods. There is little of this nervousness among those which are in the charge of a steady old broody hen, although even they want watching, because if they are not very securely shut in at night or confined to a small enclosure during the day, the most venturesome of them may stray too far and fail to return. There is certainly little fear of this when they are ranging with the hen, as she will look after them no matter what happens, and can be trusted to protect them from rats, rooks, hawks, or other vermin, and shelter them from rain.

Natural rearing, nevertheless, is child's play compared with the most simple of artificial methods. It is at night-time that special care has to be exercised, because, chickens being early risers, unless it is made absolutely impossible for them to leave the coop before breakfast time, one or other may want to get out;

and it is surprising through what a small aperture a chicken can squeeze when it desires to explore. In this matter they remind me much of certain breeds of sheep; let one of them find a hole in a hedge through which its head can pass, then assuredly will its body follow, even though much wool is lost in the passing.

Different Methods of Feeding

As there are different ways of brooding chickens, so must the feeding of them be adjusted according to the manner in which they are being brooded. But before passing on to describe what I find to be suitable diets for the various systems in vogue, let me say something of the food. Chicken food consists of wet mash, dry mash, and grain, that is, cereals, etc., and can be given in any one of these forms, while there are, in addition, vegetable food, animal matter, grit, and water.

Both wet and dry mashes are known as soft food. Wet mash should never be soaking wet, neither should it be sticky or lumpy; but at times it may be necessary to make it almost dry, or at any rate of the consistency of crumbs of a two-day-old well baked loaf of bread. The ideal state for wet mash is said to be friable, but only to the extent that if a lump of it be dropped on the floor it breaks into pieces; it must not be dry enough to be "easily reduced to powder."

This form of mash can contain few or many ingredients; and the nature and preparation of them will depend upon the age of the birds which are being fed, and the method by which they are being reared. It is prepared with water or milk, may be given cold or warm (never hot) according to the season, and should be put before the chickens as a specified meal in a trough, the receptacle being removed and scraped clean as soon as the birds have had enough—it should never be thrown upon the ground like grain, not even on the cleanest patch of lawn. It has to be prepared at least once daily, while in warm weather it should be made twice or more *per diem* according to the number of times it has to be given, because wet mash for chickens should always be "sweet" and never sour, except perhaps for those which are being fattened. But that is fattening, not strictly chick feeding.

Sussex-ground oats, English barley meal, maize meal, flaked maize, and biscuit meal are all suitable to form the basis of the wet mash, while other ingredients should be home-milled bran, and fine weatings (a standard name for English middlings, sharps, thirds, etc., although known in some parts of the country as superfine middlings and toppings). And in certain circumstances clover meal, alfalfa (lucerne) meal, white fish meal, meat meal, meat-and-bone meal, and cod-liver oil can be included.

Making Wet Mash

Wet mash is prepared with water or separated milk —this latter when it can be obtained on one's own premises; water will do. To be made palatable for chicks it needs thorough mixing. It takes time to make; and because of this, most poultry-keepers who rear on a large scale do not use it. And yet chicks generally take more readily to wet than dry mash, while if big and sturdy birds are required, then wet mash should form at least one of their daily meals. The trouble of preparing it, and the fear that if too much is made for one meal the remainder will have to be thrown away, deter some poultry-rearers from including it in the diet. But quite a large quantity can be prepared in an hour; and if any does remain after a meal it can be included in the rations of the adult stock.

Its preparation, too, is quite a simple matter, even though care has to be exercised and it may appear to be a somewhat formidable task. Biscuit meal should be soaked alone for ten minutes or longer in rather more than its own bulk of boiling water; that is, a quart of "genuine chicken biscuit meal"—not sweepings—will require about three pints of water, so as to make it swell sufficiently to be workable. When it is used, and bran, clover meal (or alfalfa meal), and fish meal (or meat meal) have to form part of the mixture, soak these latter two in another receptacle, using plenty of water, and stirring them for a few minutes.

When all is ready, that is, when the biscuit meal and the mixture are well swollen, work them together. If they are on the wet side so much the better. Then complete the mash by gradually adding the weatings and bran (dry) a little at a time. The mash must finish on the damp side, by which I mean that not a particle of it should be dry. Bran should not be soaked prior to its inclusion in chick mash, but be worked in, dry, along with the weatings. It is this part of the preparation that takes time. I use a large wooden spoon at the beginning but finish by kneading the mixture with my hands. I soak maize meal and flaked maize in the same way as biscuit meal. When Sussex-ground oats or barley meal is used it is mixed dry with the other ingredients (except weatings, which is always used for drying off) and then almost soaked with water, the spoon being kept busy all the time. This kind of mash is more difficult to prepare than that which has biscuit meal as its basis; it is apt to be sticky, and in that form it will not suit chickens. The trouble comes when cod-liver oil has to be included. Such a small proportion as 1 per cent—and

seldom should that quantity be exceeded—to be spread all through the mash, requires spreading! It must not be heated to make it run more easily, because that would destroy its vitamin content. I work it into bran—plenty of bran to prevent any of the oil getting on the mixing slab—and add it to the mash prior to drying off with the weatings, trusting to good stirring to get the desired result.

I must admit that preparing wet mash as above described does seem something of a task; but it is really not as laborious as it appears. I have prepared much in my time, but have never considered it as hard labour; and I would rather mix the mash for the whole of the stock on the farm than do a round of feeding them in winter. Still, that is another story. I know that chickens enjoy wet mash and that it improves them; any bird will eat mash in that form. However, there are those poultry feeders who cannot find time to bother with wet mash; and so they rely solely on dry mash as the soft food ration. It is well, therefore, that chickens are not too pernickety in their tastes; since, while they will select wet mash in preference to dry, they will eat freely of the latter when they have no other choice. If it be put down for them from the beginning they will take quite naturally to it in time.

Dry Mash Feeding

Birds who have been accustomed to wet mash only will not take to dry mash very rapidly—even when they are in their growing or adult stage. So, when the order is dry mash, troughs containing this food should be put down and left open most of the day after the second week of feeding, when ground rearing is the system. Until then I find it advisable to let the chickens have the use of the troughs perhaps three or four times a day, and for not longer than a quarter of an hour at the start. Dry mash can consist of similar ingredients to the wet mash, but it must not be damped in any way—except when it contains a small percentage of cod-liver oil, which, however, is really not enough to make any appreciable difference to its consistency, granted the oil has been carefully blended with the meals. As a rule it contains more ingredients than does the wet mash; and there are poultry-keepers who appear to imagine that the greater the number of different meals, etc., in its composition, the more likely it is to prove beneficial. Now these elaborate mixtures, containing a dozen or more different items, are necessary for use under two conditions only, namely, when chickens are being kept on wire floors (and dry mash forms their sole diet), and when they are being ground-reared and kept strictly intensively (indoors) throughout winter.

It must not be imagined that they are essential for birds reared under any system; they are for just those two special ones. In some cases—as, for instance, when chickens are allowed free use of grass or arable land, or are being folded—they may prove positively injurious. The practical feeder who has knowledge of foodstuffs makes his own mixtures—or, which is much less troublesome, gets his corn merchants to mix them by machinery to his formulae—and he varies their composition to suit the conditions under which his rearing operations are being carried out. The methods of brooding which have been brought into use of recent years, the modern artificial systems for mass production, have naturally called for some changes in our methods of feeding. Nevertheless, I maintain there is little justification for so many different feeding stages in a chicken's life as some authorities would have a novice believe. It may be good for trade to suggest them, but I cannot help thinking that their very numbers have acted rather as a deterrent than an encouragement to those who would go in for chick rearing.

That there must be some difference in the food of the fowl from the day-old stage to maturity is true enough; no sane person would imagine it to be otherwise, because, for instance, grain which an adult bird could digest could scarcely be picked up by a baby chick and would certainly be beyond its powers of digestion. But sturdy chickens can be and are reared when their food is quite plain. However, so much for the mashes, for the time being at any rate. Summing them up, it may be said that, while wet mash has the advantage of ensuring quicker growth, dry mash feeding is less laborious. Great care, however, must be exercised in preparing the former, and in the way in which it is given.

Suitable Grain Mixtures

When we come to consider grain or corn suitable for chickens the necessary kinds can be limited to three, namely wheat, cut, kibbled, and whole; oats in the form of split, cut, or whole groats, pinhead oatmeal, or whole and clipped; and maize, finely kibbled old corn, or as grits—from white South African mealie maize. Maize flake or a flake containing wheat and maize is sometimes given to my chickens as part of their grain ration; but it has to be put through a mincer, or crushed, to make it suitable, and it is much easier supplied to the birds in their wet mash. No doubt red wheat is the best kind for chickens, and it should be selected in preference to white; but the latter, being hard, is much more readily cut, hence cut wheat is almost invariably white. It is seldom that the old-fashioned kibbled red wheat can now be obtained; at any rate, so I am told by dealers in chicken foods, one of whom

informed me that I might be able to get it if I ordered in ton lots. But when grain is kibbled (that is, put through a kibbling machine and broken into fine or coarse particles), and particularly red wheat, it cannot be stored in sound condition for any great length of time. Hence, one has to be satisfied with cut wheat, and be careful to see that the chickens clear it up.

Genuine unbleached groats (either whole or split) are not easily obtainable, so cut groats and pinhead oatmeal have to take their place. Maize grits and finely kibbled maize are procurable from most corn merchants, and the kibbled kind will do, because, after all, chickens do not require much of it until they are well advanced. As a matter of fact, wheat can well form their staple grain; but if a mixture is required to provide the birds with variety, a hundredweight of it can consist of 70 lb. kibbled or cut wheat, 28 lb. pinhead oatmeal or unbleached groats (split at first), and 14 lb. kibbled maize or maize grits. Such a mixture as this can be given to chickens until they are sufficiently forward to digest whole wheat, say for about the first six weeks.

Another form of grain feeding is that which comes under the heading of "dry chick feed"—which, being translated, means, or should mean, a mixture of seeds specially selected for easy assimilation by chickens, before the birds are sufficiently developed to digest ordinary grain. However, while it is possible to obtain thoroughly reliable mixtures from firms who specialize in the manufacture of poultry foods—and also meals for dry and wet mashes—great care has to be exercised when purchasing "dry chick feed" from sellers who have not the least idea of the requirements of chickens, and whose sole object appears to be profit rather than to provide sound food. I have had many samples of this kind of grain mixture sent to me, but several of them have had to be condemned as containing seeds which no chicken could assimilate, or damaged grain and sweepings. I once made a list, from the numerous samples I examined in a year, of the various "foods" they contained; and, set out in lexicographical order, they were as follows: barley (pearl), beans, biscuit, buckwheat, canary seed (yellow), dari, groats, hemp, lentil, linseed, maize (kibbled), millet, peas (split), rice, and wheat (cut), as well as ants' "eggs," bone (crushed), charcoal (granulated), flies (dried), greaves, grit (flint), insects of various species, meat (dried and ground), and shell (cockle and oyster)—and even raisin stones.

Now, it may be that all these items are devoured by fowls; but many of them could not possibly be digested by chicks of such a tender age as to require "dry chick feed." And, as chickens appear to have some power of discrimination in the matter of diet, I question if, were such a mixture placed before them, they would select more than three or four different kinds of seed. Such a number will certainly suffice to provide them with all that is necessary to keep them healthy if they are allowed to range. In these circumstances I have frequently used no other grain than wheat for rearing, giving it to the birds in its kibbled form at first. Still, as chickens which are being ground-reared by artificial means appear to require some variety until they are about two months old, and especially when, in winter, they have to spend much of their time indoors, it is advisable to give them a reliable dry chick food or such a mixture as I mention in the previous paragraph.

How to Provide Green Food

Because it has been so long the custom to rear chickens on grassland, we have come to believe that they cannot thrive without some kind of green food, and that if they cannot get grass then they should be provided with fresh and young vegetable matter as part of their daily ration. Scientists have shown us that some kinds of green food, notably cabbage and lettuce, contain vitamins, the factors which help birds to extract the maximum of nourishment from their food. And yet I find that raw cabbage is not suitable for chicks in their early days, while lettuce is never available—for my chickens at any rate—in winter; and even when it can be obtained the birds do not appear to appreciate it in its early cabbage form, although when they have reached their growing stage they are partial to a freshly pulled head of cos, either growing or bolted. However, ignoring for the time being the matter of vitamins, after chickens are a week old—until which age they eat practically little of anything—they like to pick over some fresh young greens; and they prefer to have this food securely fixed and bunched rather than chopped and put into a rack or a trough.

I generally tie it for them in such a way that they can "dig" their beaks into it, although occasionally I suspend it just above their heads, as it keeps them busy and provides them with a change of occupation. It happens that they do not always eat it as they stand; sometimes a much larger portion than can be swallowed is torn off, and before it is eaten it gets dragged about the ground. Still, whatever dirt it may collect does not appear to make any difference to the birds' health. So, rather than withhold green food because it is not always as clean as it might be, I just let them eat it in the way that suits them. Mincing fresh green food and putting it into a trough or a net may encourage chickens to eat it too quickly, and to eat more of it than may be good for them. On no account should it be put before them when they are hungry. Two points I always observe when providing

chickens with this food—to give it to them immediately after a meal, generally when their breakfast is put down, and to remove any from the floor as often as I happen to be near, but always in the evening.

There are many kinds of green food suitable for chickens. The best, undoubtedly, is growing grass, such as they get from short and well-clipped turf, and not that which is long, tough and coarse, as the latter is apt to cause crop and gizzard troubles. Failing a grass plot, from which the birds can pick and choose, then a handful of fine lawn cuttings from a low-geared mower will be appreciated; but, if given indoors, they may be troublesome to collect at the end of the day—and they should not be left down long enough to get limp and stale. They might be put into a trough; but, as I say, this method is inclined to make chickens gorge. When I have used lawn clippings, they have been given to chickens which were reared on earth runs; and in this case I put down a handful or so for the birds in a long line—often in the form of a circle—rather than in a heap. Of the herbs, etc., chickweed, chicory (succory or wild endive), corn-salad, dandelion, endive, nettle, onion, parsley, and sorrel are all safe for chickens. Onions (as scallions or the fully-grown bulb) are particularly beneficial; and mash flavoured with onion is valuable when colds are feared, or as a preventive of gapes. Nettles must be gathered when they are quite young and before they become stalky; and if they are cut short, fresh growths will soon appear. They should be boiled and chopped, and mixed with the wet mash. The other kinds—chickweed, dandelion, onion, etc.—must be finely minced (raw) and, too, used in the wet mash, because chickens rarely eat them alone if hand-pulled or cut.

Sprouted Grain

Sprouted grain is also relished, although I consider it a somewhat expensive form in which to supply green food to chickens. Still, many rearers find it serviceable when fresh green food is not available. To prepare it good, heavy, natural grain, not bleached or clipped, is required. Warmth and moisture are essential for growth—earth is not needed—but not too much water to rot the roots or set up mould. A little practice is necessary to ascertain the correct amount. The grain can be sprouted in shallow boxes, with 3 in. to 5 in. sides, similar to those used for seedlings, in trays in a rack, or in special cabinets heated by oil. The oats should be soaked in warm water for about twenty-four hours, then spread an inch thick on the trays so that the excess water will drain off. They require sprinkling daily, and should be ready in a week, the sprouts being 2 in. to 3 in. long.

In connexion with the sprouting of oats for fowls an American authority says that the oats should be covered with something to act as a blanket and conserve the moisture, and suggests burlap. Also to prevent mould, about 10 drops of formalin should be put in the pail of water in which the grain is soaked; and that all trays, etc., should be sprayed with a solution of formalin at regular intervals. In my opinion this form of green food is not cheap, at any rate nothing like as cheap as growing kale, etc., but it is decidedly convenient for small quarters. Probably the best way in which to supply it to chickens is to cut out a section, chop it finely, and put it into a trough. Some poultry-keepers, however, put the box or tray into the run and let the birds help themselves. The former method appeals to me as likely to prevent crop trouble. It is not advisable to include fruit or fruit parings in the chicken diet; but there are dry substitutes for vegetable matter, which suit the birds tolerably well. These are alfalfa (lucerne) meal, clover meal, and chaffed hay, the first-named being undoubtedly the best for quite young chicks. It should be included in the mash (either the dry or the wet mixture) and not given as a separate meal.

Animal Protein

Sound scraps of unsalted fish and lean or fat meat (beef, mutton, pork, rabbit, or veal, or bacon and its rind) will provide chickens with animal protein; in fact, this is the best form in which such protein can be supplied to the birds for easy digestion. They should be boiled and put through a mincer, care being taken to remove any gristle. Liver and lights, and the residue of fat specially prepared for dripping, similarly treated, will also prove quite suitable. However, although I have occasionally been able to obtain such waste meats from butchers, etc., in fairly large quantities, it will probably be found more convenient, when much animal proteids are required, to purchase fish meal, meat meal, or meat-and-bone meal. These three kinds are finely ground and guaranteed as food for chickens. Certain proportions are specified for different mixtures of dry or wet mash; but it is much better to begin with what is practically a mere flavouring and gradually to increase to the required percentage, than to start off with the maximum quantity.

Bones are included as "meat." They can be given in two forms, viz. raw, and shaved or pounded (known as "cut green bone," i.e. fresh and not of a green colour), and as meal. This latter, white bone meal, must be that which is prepared from sterilized and steamed bones. Great care should be taken that a reliable brand of it is obtained; and only meal specially made of bones from which the fat has been extracted solely by steam should be given. Some

meals, or so-called "bone flour," have occasionally come under my notice, but they are useless, in fact positively poisonous for chickens. Both cut green bone and bone meal can be prepared at home, the former (soft, and not shin bone) being reduced in a bone-cutting machine and the latter, after being boiled, mealed in a kibbler. Suitable machines are on the market; but unless a very considerable stock of birds is being reared, it would scarcely pay to invest in one.

Most poultry-farmers find it more convenient to purchase either "cut green bone" (from a butcher) or bone meal from a corn merchant. The hand cutting and kibbling of bones are very tedious tasks; and the time taken to prepare sufficient for a day only can be, in my experience, more profitably devoted to some other task on the farm. I find that it suits my purpose much better to purchase what bone meal I require than to prepare it on the premises. There is, of course, no necessity to add animal protein in any form to the diet of chickens which are allowed their freedom, where they can, and will, get natural flesh food in the worms and insects they devour. It is imperative, however, not to permit them to range over land on which pheasants or other birds with gapes have been reared, because the eggs of the gape worm have been found in earth worms. I mention this because while it is generally the custom to rear pheasants on fresh land each season, that which has been vacated is frequently used the following season for chick rearing.

Lime and Grit

There are still other items which are included in the diet of chickens, such items, for instance, as lime, cod-liver oil, grit, charcoal, milk, and mineral mixtures. What a list! And yet, some or all of them are doubtless necessary for birds which are being reared intensively—they must be provided with certain extras to compensate them for the oddments which chickens find when at large. Such, in truth, are the penalties we have to pay for rearing chickens far in advance of their natural hatching season, and keeping them in such numbers and under such conditions as they were never intended to be; because fowls are not highly gregarious by nature, and chickens thrive exceedingly well with very little attention when they are brought up in small broods at liberty. However, the demands of to-day are not those of yesterday; hence it happens that we cannot very well rear, solely by Nature's ways, all the vast quantities which are now required. Ground limestone or crushed oyster shell (which contains phosphate of lime) and crude cod-liver oil (rich in vitamin D) are essential, because they obviate any tendency to rickets, an ailment which has a weakening effect upon the system and lowers its resistance to infectious and microbal diseases.

We are told that all fowls need grit from their earliest days; that it is natural for them to take as much sharp flint grit as they require for the mastication of the food in their gizzard; that if the poultry-keeper does not trouble to provide them with it they will help themselves to whatever their instinct teaches them will serve the purpose; that if it be not supplied to them in the right grade, or they are forced to take too much or cannot get enough, complications are likely to arise which may cause deaths. It would appear, therefore, as if flint grit—rough, hard particles—were a most important item in the dietary of chickens. And yet, on more than one occasion for experimental purposes, I have kept chickens entirely without grit of any sort, and they have digested their food quite normally and remained in perfect health. As a matter of fact some poultry-keepers have peculiar notions about grit, and many of them still believe that a bird takes it solely for the purpose of grinding the food in its gizzard—because it does not possess teeth. They even offer grit to chicks as the first "meal"; so, small wonder, perhaps, that some birds do not thrive.

It is true that, when chickens have an open run, they scratch about and pick up many rough and hard particles; but except on very rare occasions—as, for instance, when they are starving—they will not go deliberately to a box of flint grit and fill their crops therefrom, or, indeed, more than pick over the material, apparently in search of food. What grit they eat in their run is taken because there is adhering to it that which the chickens know to be food. They would rather take the lot for the little than miss that little. Possibly flint serves a certain purpose, because scientists tell us that it enters into the formation of the feathers. However, sharp grit—and, almost invariably, flint is chosen—is very apt to cause irritation or laceration of the crop and other internal organs. That grit is beneficial there can be no doubt, because it satisfies the chickens' need of mineral salts; and for this purpose a mixture of Derbyshire limestone grit and finely crushed oyster shell should be provided. Calcium is required in comparatively large quantities by all fowls, from the shell until the end of their lives. So, if chickens must be kept intensively they should get grit in their dry mash or their grain mixture. The quantities vary according to the food which is used; but where grit is not included in the tables which follow, it will be sufficient to mix a small handful with each bucketful of grain, for chickens which are kept intensively.

Charcoal

A chicken's digestion is held to be a very delicate affair, needing most careful supervision. Hence,

charcoal being recognized as an excellent aid to digestion, there are poultry-keepers who give it to their chickens. Some of them add it to the food in the proportion of 4 per cent, using it in ground form for the mash and granulated for inclusion in the grain mixture. Others use granulated charcoal only, and put it into a separate container, so that the chickens can help themselves. In mixing it with mash—it should never be soaked, but added with the last of the middlings—the whole of the birds are likely to eat it, whereas some of them might never take it from a container although it would probably attract them in "dry chick feed."

Most chickens are supposed to possess excellent powers of discrimination in the matter of diet, and to refuse food which is known to be indigestible. That appears to be so in some mixtures of grain which are sold as the "feed" just mentioned; but my experience is that their tastes differ. Some will eat charcoal and others will not look at it; and I cannot say that I have found the latter suffer because they went short. What they seldom refuse, however, is to pick over ashes from the ordinary household grate; and a heap of such waste, always mixed with an equal quantity or more of freshly dug and reasonably dry earth, will provide them with exercise for quite a long time. I am averse to the use of ash as a dust bath; but when given to chickens in the manner I suggest, they generally manage to find something in it to keep them busy. On no account should ashes be put into the hover cabin or the brooder house, but into the outside run and under any rough shelter.

Milk and Minerals

Experiments conducted in various parts of the country go to show that milk as a protein constituent is equal to any of the concentrates used for protein supply. It may be because of this that chickens which get bread and milk or biscuit meal soaked in milk during their very early stages make such good growth. No doubt milk is a body builder; and as it contains lactic acid, it is a valuable asset against digestive disorders. When given to chickens to drink it should be skim, as new milk is too rich for them; the vessels must be kept scrupulously clean and the fluid removed immediately the birds have satisfied their thirst, while access should also be allowed to water. Whenever it is available, therefore, it could be given to growers, and, at any rate, up to twelve weeks of age. It is not absolutely essential to their well-being, but it is an excellent food, either fresh or when "solidly sour," but dangerous when "on the turn." Failing a supply of skim milk, milk powder may be substituted.

An important part in the feeding of chickens, and particularly those which are reared on wire floors, is to provide them with mineral salts in order that they may develop good frames. All poultry foods contain a certain amount of mineral salts, which are necessary for the regulation of the various functions of the animal body. Because of this, it is becoming the custom to supplement the ordinary diet with mineral mixtures, no matter under what conditions the birds are being reared. It is, nevertheless, a great mistake to add minerals, or even salt, to the food of chickens which are being brought up on spacious earth or grass runs, granted they get a well-balanced diet including sound cereal meals, weatings, bran, fish meal, meat-and-bone meal, skim milk, fresh green food, and limestone grit or oyster shell. If chickens are kept where they cannot get good supplies of grass, herbs, and greens, and natural salts from the oddments they find in their range, then a plain mineral mixture may be added to their diet. I cannot say that these mineral mixtures appeal to me as a necessary part of the feeding of chicks which are reared under normal conditions; but, if they must be used, then a mixture, by weight, of one part each charcoal, sterilized steamed bone flour, and finely-ground limestone or oyster shell, with one-half part of rough salt is recommended as 1 in 200 (one-half per cent) of the meal mixture.

Vitamins

Much has been said of recent times on the subject of those, as yet, only partially understood substances called "vitamins." Under normal conditions, however, and granted the birds get foods containing mineral salts, as just mentioned, chicks obtain all the vitamins they require, aided by sunlight. Under modern brooder conditions, nevertheless, they are deprived of much of this natural source of supply; hence the necessity for providing them with special vitamin-rich ingredients in their diet. Cod-liver oil is one of the best-known vitamin foods, as oil of the right grade is rich in A and D; but only cod-liver oil of a tested and guaranteed vitamin quality is suitable for chickens. Science has discovered the existence of at least four important vitamins—A, B, C, and D—each of which is essential for a certain phase of growth, or for the prevention of a particular type of disease. No food possesses all four of these vitamins in the quantity required by the human system; but none has a wider content than eggs. Vitamins A and D, essential to growth, to the prevention of certain eye troubles, and to the proper development of bones and teeth, are found abundantly in eggs, while vitamin B, the vitamin of yeast, is also present in moderate quantities. However, practical poultrymen know that much egg food upsets chicks; so, candidly, the chick rearer will do better to leave vitamins to the scientist and pay attention to sound foodstuffs for his birds.

Drink

Last, but by no means least, there is the drink question. Chickens must drink. Water is one of the essentials of life; it enters into the composition of the blood, the bones, and the flesh. Some rearers put water troughs into the brooder house as soon as the chicks are transferred to it; that is, the birds have the opportunity to drink at any time during the thirty-six to forty-eight hours or longer before they get their first meal. Whether they do drink or not I cannot say; but my chickens are never allowed to do so until the first meal is given, when water vessels are placed where the birds can easily find them, and from that time clean and fresh water is always within their reach.

FIG. 128. THE WATER TROUGH

Placing the water trough on a slatted platform in the grass run prevents the ground becoming foul by the birds trampling it while drinking

There are poultrymen who withhold water until the birds are well over a month old, supplying the chickens until then with skim milk. On the other hand, some give their chickens water which has been boiled and with a little saffron in it, others that which is lightly tinted with potassium permanganate, and yet others mix a scraping of block camphor in it. It may be necessary in some instances so to medicate the water; but, except in very rare cases, that which is fit for human beings is also good for chickens. And nothing should be added to it, because, properly fed, the birds do not require any medicine or liver tonic. Filtered rain-water is serviceable, if caught from a plain tiled or slate roof and stored in clean butts or tanks; it is soft, and generally deliciously cool. However, chickens should not be deprived of clean water; and the vessels must never be allowed to run dry, particularly in summer. Once this happens and an extra thirst is created, there will be a scramble when the next supply is put down; and not only is there then the likelihood of some birds getting injured in the rush, but those who do reach the trough will drink more than is good for them.

The water must be fresh once daily; in the early part of the season this will probably suffice, but by springtime and then onwards the water should be replenished twice or thrice each day, the drinking vessels on each occasion being emptied and rinsed with disinfectant, such as potassium permanganate or any commercial fluid disinfectant. This is of the utmost importance when chicks are being reared in brooder houses, where, on account of the dust scratched up by the birds searching for grain in the litter, it is next to impossible to keep the water clean for any length of time. The supplying of fresh water in clean vessels is also necessary for chickens kept on outdoor runs, because in these circumstances the troughs attract birds of the air, which may be disease carriers. There should always be plenty of water to last for the day, but not longer; that is, large and deep containers should not be used, because sometimes they are apt to be just topped up instead of being emptied and rinsed through—a light task this latter, and well worth doing. Moreover, should a bird fall into the water there is little chance of escape; and chicks have been known to drown in such a way. I am, of course, referring to the very early stages of chickenhood, to the "babies" up to a week or so old.

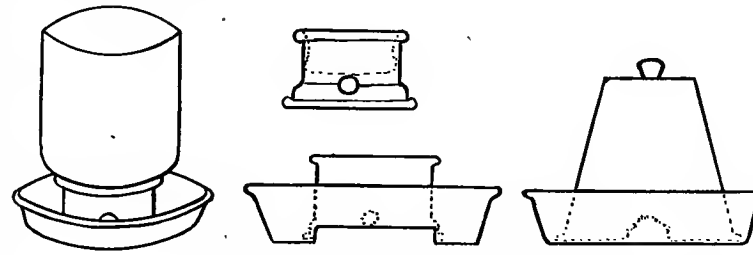


FIG. 129. WATER VESSELS FOR CHICKS

On the left the glass jam-jar "fountain" and fitments, viz. the neck (top, centre) and the saucer, both made of aluminium. The former fits the neck of the jar, and also the raised bottom section of the saucer

On the right, the inverted flower pot. A small piece is sawn out of the top edge of the pot (as shown at the dotted line), and the bottom hole corked. The pot is then filled, right way up, the saucer placed on, and the whole quickly turned upside down

Suitable Vessels

If an open vessel be used for such youngsters it should be of the very small shallow pie-dish kind without a rim, almost straight down at the sides, so that the water can be readily reached; a saucer is useless for the purpose. The vessel I find best of all for ground rearing is the inverted 2 lb. glass jam-jar "fountain"; the drinking space, though small, allows several chicks to drink at once. I much prefer it to

the hanging vinegar bottle type, which I first used nearly half a century ago, and which is still being recommended; it is difficult to keep clean. A flower pot with a cork plugged into the hole, and inverted in its own saucer, makes an excellent water trough for chickens, because both kinds of pot can be so very easily cleaned. Water in a brooder house soon loses its freshness; and if the birds are being fed on the dry mash system particles of the food get into it every time they drink, while, unless the vessel is put well above the floor, some of the litter scratched up in the vicinity is likely to foul it.

When separated milk is given as the drink—full milk is too rich for chicks—it must be put down with the soft food only, and not allowed to remain in the trough all day long. It is most essential to remove it as soon as the chicks have quenched their thirst. Sour milk is beneficial, but, as stated, that "on the turn" is detrimental. For this reason, when milk enters into the diet it should be in the mash. I certainly do not let chickens drink it, because the cleaning of the vessels in connexion with it adds considerably to one's labours; and there is plenty to do in the chick season with the usual routine—such extras are certainly barred. The drink question is an important one; but all will be well if water is withheld until the first meal is put down, and particularly if that meal is not a big one. There will not be excessive thirst if the chicks are properly fed, and so kept that they do not catch cold. Always remember that fresh air never kills; so get the chickens accustomed to it from the first. It makes them eat and drink in a rational manner, and prevents that excessive dryness which forces them to have to resort to the water trough.

Some authorities say that chicks must be taught to drink by having their beaks dipped in the water. In connexion with some experiments being conducted in America it was stated that chicks do not recognize water by sight, even when they are thirsty. They would not swallow a big drop from the experimenter's finger, it was reported, when he touched their beak; they would walk through or stand in a saucer full of water without recognizing for what purpose it was intended. But when a chick, standing in the water, happened to peck at its toes, then enlightenment followed; "the beak went up to the sky in the familiar fashion," and thereafter water was recognized. Mayhap those chicks were of a special breed; at any rate, I have not known them to refuse water. Healthy chicks know how to drink; and when a pan of water is placed before them, they know for what purpose it is there. If they are thirsty they will drink.

Feeding Systems

So much, then, for food and drink. The novice will have gained some idea by now of what chickens can eat. What they should eat to enable them to thrive is really what matters. But this, their correct feeding, depends to a great extent upon the method by which the birds are being brooded and subsequently reared during their growing and developing stage. Perhaps it is as well to commence by stating that no single feeding method will suit every case; simply because it cannot always fit in with the various details of management. It has been said that only a very bold or foolish person would lay down hard-and-fast rules covering every detail of chick feeding and declare them to be the best. That is, indeed, true enough; and proof of it is found in the different diets, widely varied, upon which chicks are successfully raised. It must not be thought, however, that by making such a statement I wish to evade the subject. On the contrary, I am going to be so bold as to describe certain methods with which I am familiar by personal experience; and while they cannot possibly suit every case, they can scarcely fail, nevertheless, to act as efficient guides for beginners.

During the many years I have been connected with the poultry business, and specializing in it, I have gained some knowledge of chickens and their requirements from the shell to maturity; and in their upbringing I have tried various feeding systems, among them grain and wet mash, all grain, grain and dry mash, dry mash only, all wet mash, and a combination of grain with wet and dry mashes. I have had my failures, a-plenty; but, despite them, I have kept steadily on learning from that best and hardest of teachers—experience. It is never wise to criticize a system before giving it a good trial, nor to condemn it because it has not proved successful at first. I was probably among the first poultry-keepers in this country to test the American dry mash system of feeding, beginning on a small scale, because of the element of risk in changing over from the teachings of my forefathers. I adopted it with an open mind, since there were possibilities in it. Those first attempts were failures, not the least reason being that I was feeding rats rather than birds. However, experience teaches; in certain circumstances chicks thrive on an all mash diet. The system of feeding must be considered strictly in connexion with the method of brooding.

Quantity of Food for Each Meal

There is one matter which is likely to trouble the beginner when he is rearing chickens on a combination of grain and wet mash, or giving them grain in conjunction with dry mash, and that is, the quantity of each kind which should be allowed as a meal for a specified number of birds; or, to put it another way, how much food a chicken should be given *per diem*.

The question has frequently been put to me; but it is very much easier asked than answered. I once asked an old friend, well versed in such matters, if he could state it; and his reply was to the effect that a handful of food will go a long way with a hundred or so chicks a week old! It was not much of a guide, to be sure; and yet, few experienced chick feeders weigh or measure the food given to their birds in the early stages, or probably at any period. As a matter of fact, it is most difficult to state a specified quantity, because, while it is said that a good rule for chick feeding is "little and often," and that during their first week chickens can scarcely have too many meals, I find that they require very little food until they are a week old.

I must admit that, during the rearing season, while the chicks are being brooded, I have never yet found time to weigh or apportion to each lot a specified quantity of food, be it wet mash or grain. It is impossible to do so when rearing by hens; at least, let me say that I have never troubled to be so particular, because, oftentimes, the chicks will not eat unless the hen picks over the food for them, and what they do not require is almost invariably her portion. One thing I do observe, however, is to avoid giving such a quantity of wet mash that any is left about to get fouled and sour. This rarely happens when the food is within reach of the hen; but when chicks are being artificially reared I take particular care to remove what remains when the birds indicate that they have had enough. If all the broods were of equal size, numerically, and of level ages, then I might be inclined to put down specified amounts. And yet, by doing so, there would be the possibility of a shortage or a surplus at times, according to the varying appetites of the chicks. The best rule is to see that they clear their grain before wet mash is put down, and to remove any soft food after the birds have had their fill. There must be no stinting of food.

With regard to the quantities of food consumed in a specified period, the following tables, giving the results of tests in the rearing of chickens to twelve weeks old are interesting. Table No. 1 shows those of trials which were undertaken almost thirty years ago at three experimental stations (Berkshire, Northumberland, and Shropshire), as well as by two private breeders. And although, as was usual at that time, little regard was paid to the breed of fowl being utilized for the purpose, and particulars of the foods are lacking, the system of feeding was the customary one of grain and wet mash.

In connexion with the above table it is evident that in the Northumberland test, the remarkable increase of food consumed, compared with the average of the other four, is accounted for by the fact that the mash was weighed after being prepared, and, therefore, included the weight of the water mixed with it. It is worth noting that, whereas in one county (Berkshire) the averages were almost 6 lb. of food to produce a chicken scaling well under 2 lb., in another county (Sussex) they were an ounce over 4½ lb. of food for a 3-lb. bird. It may be remarked that the weights of these two lots of chickens—respectively, White Leghorns and Sussex—are about normal for cockerels of these breeds.

In the second table—which was compiled quite recently to demonstrate how, by the use of certain meals, grains, etc., birds can be reared to three months old at an average and very economical food cost of 9½d. a head—more data are available. Records were kept of 200 Light Sussex which were hatched on 22nd January, 250 Rhode Island Reds hatched on 19th February, and 215 White Wyandottes hatched on 19th March. Each lot of chickens was fed on the dry system, which was as follows—

First month: chick mash was given from troughs, and it was always before the birds, so that they took what they required. Grain—"scratch feed," consisting of mixed seeds scattered over the litter to promote exercise—was given sparingly in the morning, but "as much as could be readily eaten" was allowed in the evening.

Second month: the troughs containing the chick mash were opened at 10 a.m. and closed at 3 p.m. Grain, consisting of wheat or mixed corn in addition to the "scratch feed," was given in the morning and evening as during the first month.

Third month: growers' mash (dry) took the place

REARING TABLE No. 1

County in which Trial was held	No. of Chickens	Total Food Eaten	Average Food Consumed per Chicken	Average Weight of Chicken at End of Trial
		lb.	lb. oz.	lb. oz.
Northumberland	41	443	10 12	3 1
Shropshire	16	89	5 9	1 15
Berkshire	30	179	5 15	1 10
Surrey	12	53	4 7	2 12
Sussex	53	242	4 9	3 0

of chick mash, and it was available from 10 a.m. to 3 p.m. The "scratch feed" was discontinued in favour of wheat or mixed corn; the times of feeding and quantities (considerably increased, of course) were similar to those prevailing all through, just two meals of grain *per diem*, with the greater portion as the second (evening) meal.

The sexes of the chickens used in this test were practically in equal numbers, there being slightly more Wyandotte cockerels than pullets and the reverse in the other breeds. The average consumption of food *per capita* for the three months works out as follows: Light Sussex, 3 lb. 14 oz. meal and 4 lb. 3 oz. grain (approx.); Rhode Island Reds, 3 lb. 6 oz. meal and 3 lb. 13 oz. grain (approx.); and White Wyandottes 3 lb. 10 oz. meal and 4 lb. 1 oz. grain (approx.). Not having any three-month-old chickens in my possession as I write, I cannot compare notes; but, weighing the daily rations for birds of other ages, they are as follows—

A mixed brood of two-month-old Light Sussex, White Wyandottes, and Rhode Island Reds—all pure bred, to the number of 120, and kept in a large grass pen—get 12 lb. of wet mash (the weight of the meals, etc., composing it prior to preparing them with water) and 100 handfuls (about 12½ lb.) of wheat, which makes the daily average 1⅗ oz. a head of meal, and 1⅔ oz. of grain.

A second bunch, of four-month-old Buff Rock, Jersey Giant, and Rhode Island Red pullets—numbering 108, and allowed free range—consumed 16 lb. of wet mash (the meals, etc., in their dry state as above) and 15 lb. of wheat, which averaged practically 2⅛oz. of meal and 2¼ oz. of grain. In both of these cases the birds get four meals daily, two of grain and two of wet mash.

A third lot, also four months old, but White Wyandotte pullets to the total of 112, are being dry fed. On an average they consume 11 lb. of dry mash daily, as well as 8 lb. of corn—wheat and kibbled maize mixed in equal parts by strike measure. These quantities work out at rather more than 1½ oz. of soft food and 1⅐ oz. of hard food a head *per diem*. The birds range where they will. They scale between 4 lb. and 5 lb. each. Hence, this apparent shortage of food, compared with the other two batches, is not having a detrimental effect. It is very evident to me, nevertheless, that they have some secret food supply (natural or otherwise) on their range—a matter, this, for investigation!

Now, from the above particulars the novice may be able to gather some idea of the quantity of food which a specified number of chickens should eat at the different stages of their growth; but, as he will see, it varies. He will note from Table No. 2 that during the whole three months very little difference is made in the quantities, despite the difference in the size of the broods. Particularly is this so in the third month, when 200 Light Sussex received the same amount of food (8 cwt.) as 250 Rhode Island Reds. Both of these breeds belong to the same group, viz. the general-purpose one; but, it might well have been that the Sussex chickens were being brought along for table purposes, and the others for stock, which would account for the excess. However, as an example of how quantities do differ let us take the figures for the second month in Table No. 2. The total of 665 chickens consumed 17 cwt. of food. If we allow for the period being a lunar month (28 days) it means that the average consumption of food by each bird was about 2 lb. 14 oz.; which amounts to slightly under 1¾ oz. daily.

Comparing this with my 120 two-month-old chickens mentioned in a preceding paragraph with a total of

REARING TABLE No. 2

Breed Used in Trial	No. of Chickens	Total Amount of Food Consumed					
		First Month		Second Month		Third Month	
		Dry Mash	Grain	Dry Mash	Grain	Dry Mash	Grain
Light Sussex (January-hatched)	200	1 cwt. chick meal	½ cwt. scratch feed	3 cwt. chick meal	1 cwt. scratch feed, 1 cwt. mixed corn	3 cwt. growers' mash	3 cwt. mixed corn, 2 cwt. wheat
Rhode Island Red (February-hatched)	250	1½ cwt. chick meal	⅝ cwt. scratch feed	3 cwt. chick meal	1 cwt. scratch feed, 2 cwt. wheat	3 cwt. growers' mash	5 cwt. wheat
White Wyandotte (March-hatched)	215	1 cwt. chick meal	⅞ cwt. scratch feed	2 cwt. chick meal, 1 cwt. growers' mash	1 cwt. scratch feed, 2 cwt. wheat	3 cwt. growers' mash	4 cwt. wheat

slightly over 3¼ oz. each *per diem*, it might certainly appear as if my chickens are eating far more food than is necessary. Granted they are getting four meals each day, while the tabled birds got two meals of grain and were allowed free access to the dry mash hoppers from 10 a.m. until 3 p.m. There is, of course, a difference in the systems as regards the soft food, because mine is given wet, at least as wet mash rather than dry, and as a set meal, one which is not before the chickens for five hours at a stretch, scarcely for much longer than as many minutes. Neither is this considerable difference in the weights of the foods accounted for by the difference in the condition of the mash, because if properly administered, chickens will eat rather more of dry than wet mash. And I am quite satisfied that my birds are not being overfed.

It is a general belief that more chickens die from overfeeding than starvation, and that novices almost invariably tend to give their birds too much than too little food. But, although I am always learning—one is never too old to learn—I do think that, as far as chick feeding is concerned, I have passed out of my novitiate. Experience teaches me that chickens can scarcely have too much of the right kind of food when they have passed out of their "baby" stage; it is during their earliest days that the greatest care has to be exercised in their feeding, and it is then that no attempt should be made to induce them to overeat. And so to the systems of feeding.

Feeding Chickens with the Hen

The smallest broods will be those with the hens, when they are being reared as they were intended to be by Nature. And hens are, at times, accommodating creatures. I have had as many as a score of chicks under a natural mother on more than one occasion —and not bantam chicks either—and twice succeeded with a double batch. As a rule, though, the maximum seldom exceeds a dozen, even with a big two-year-old barndoor hen accustomed to spending much of her time clucking around.

When chicks are being brought up by a hen it is rarely they show any desire to feed during the first day. Their sole idea appears to be to keep warm; and the hen's mission is to keep them so. If food be placed before them she will probably resent such interference and refuse to call them to eat. Especially is this the case if she has been well fed as soon as she has hatched off her clutch of eggs. There is a reason for it as I have shown—the yolk which the chick absorbed just before hatching time will sustain it for at least thirty hours. Hence, beyond seeing that the hen does get a full meal before she is put into a clean and comfortable rearing coop, leave the chicks to her for the first day. She must be well fed then and allowed to stretch her wings, otherwise she is likely to become restless and not in a state to brood the birds properly. During the first week or so chicks require very little food, but what little they get should be of the right sort; and beyond placing before them light food which they can swallow and digest, no attempt should be made to force them to eat.

For hen-reared chicks I have not found a better system than wet mash and grain; at any rate, during the whole time they are with the hen, my birds do not get dry mash. Some authorities assert that it is much easier to change from dry mash to wet than vice versa. It is true that any chicken will eat wet mash and that it must be educated to the dry mash habit; but, while young fowls which have been brought up on the wet mash system may not take rapidly to dry meals, it is not essential that they have dry feeding from the shell should it be found necessary to give them soft food in such a form when they are off brooder heat, or even at the laying stage. The mistake so often made is to change over too abruptly. When, therefore, it is necessary to make a change it should be a gradual one and, in the case of pullets, completed before they come into lay. They must be educated to it; and that is where common sense is so beneficial. However, for the time being we are considering the first meal which is offered to the chicks with the hen, during their second day. It must be light and nourishing to be of service, easy enough to digest and of a nature to start the machinery, as it were.

The First Meal

There are still plenty of good rearers who continue along the old-fashioned lines and give their birds hard-boiled egg (yolk only) rubbed into stale bread crumbs or broken "Osborne" biscuit, or egg custard. I have reared many sturdy chickens on this system and given them such a diet for the first two or three days; and, despite the supposed unsuitability of it, they survived and progressed. Some writers declare that eggs in any form must be unsuitable, because the chick has its own yolk nourishment on which it can live for a few days; hence if food of a similar nature is given, it leads to decomposition of the absorbed yolk substance, and death. It cannot be that eggs are unsuitable, because, as I have said, scientists have discovered that four vitamins exist in eggs, and that each is essential for a certain phase of growth. Of recent years, though, I have found better uses for eggs, so I substitute milk for yolk. The first meal of "baby" chicks which are being hen-reared is, therefore, bread and milk; and since that diet has been adopted, I have had no cause to regret it.

It is true that wet mash feeding requires more care

in the preparation of the food and in the method of feeding. It is so with the first meal of bread and milk, and any subsequent meals of a similar nature. It must be properly prepared, put into a clean vessel and removed as soon as the birds have finished their meal. Perhaps because a certain well-known brand of brown bread is the only bread of its kind eaten in my household, I use it for the chickens. One slice, a quarter of an inch thick, of the usual small loaf—the crumb only and not the crust—and at least two days old, is soaked in boiling water for a few seconds, squeezed out, covered with about a tablespoonful of skimmed milk and then broken down with a fork. Such a quantity is more than ample for a full brood under a hen, as their first meal. Put it into a very shallow receptacle—the ash tray lid of a tobacco tin is very handy for the purpose—which should be placed inside the coop. Perhaps only two or three of the chicks will sample it at the beginning; but if the hen has not been taken out of the coop for her daily exercise, she will probably call them to eat, and show them how to use their beaks.

This soft food can be offered to them for breakfast, at mid-day, and again towards evening, daily for the first three or four days. They should be taking it fairly well by the fourth day, in which case let them have a fourth daily meal as their "supper," but well ahead of nightfall, so that they can see to eat. This meal can be pinhead oatmeal, unbleached cut groats, kibbled wheat, or a reliable brand of dry chick food —a mixture of suitable seed for "baby" chicks. When using bread it must be brown, because the bran in it is beneficial to promote the action of the bowels. The milk—never full milk, unless mixed with an equal quantity of water—is a good cleanser and promotes digestion. Failing bread, I have used chicken biscuit meal, which is finely granulated, and added a pinch of bran to it. There are now some excellent chick meals on the market; and as they contain all that is necessary, they may certainly be given to the birds instead of bread or biscuit.

There is really no need to worry if the chickens do not eat as heartily at first as some novices are apt to think they should do; and if meal is offered to them about thrice daily at this stage it is all that need be done. I know the old slogan was "little and often"; the little is right, the often, wrong. When they have found their appetite they will do justice to their food, if that food is in order. They do not require anything in the way of tonics or the usual etceteras such as green food or grit; but a small pan of clean water should be put down where the hen also can reach it, and so firmly fixed that the chickens cannot upset it, walk into the water, or scratch litter into it. By the beginning of the second week the middle meal could be changed to mash made of cereal meals—or any good brand of chick meal—prepared with milk and water or skim milk, and dried off with superfine middlings.

During the early part of the rearing season, even for such young chicks as are now being considered, I do not hesitate to give them cod-liver oil; and I also begin the onion diet, but start it as a mere flavouring, by using the water in which an onion has been boiled. In this very mild form it is beneficial; and when the bird's system gets accustomed to it, by the third or fourth week, a very small piece of raw onion can be minced and mixed in the mash. In cold weather, too, meat is added; but here again I begin with a flavouring and use the water in which any scraps are boiled for the dogs and cats, surplus gravy from joints, or a little beef, mutton, or pork dripping. All these items may be "fiddling"; but there is generally plenty of time for doing the most trifling of jobs when one is rearing chickens by hens. And this reminds me. As it is essential that the birds are not too generously fed in their very early youth, the novice will see the necessity of removing the hen out of their way when she has to have her daily meal; and one full meal of corn with a drink of water will suffice. Of course, if she refuse her own food, let her feed with the chicks. She can, and often does, drink from the chicks' fountain—which means keeping an eye on the water supply, in summer especially—and often she will finish what food the chickens do not require.

Wet Mash Mixtures

The following wet mash mixtures will assist the novice in preparing suitable food for hen-reared chicks. They produce excellent results.

First week

Brown bread and milk (prepared as mentioned above).

From 1 week to 5 weeks

Weatings (middlings, etc.)	4 parts by strike measure
Chick biscuit meal	2 ,, ,, ,,
Sussex-ground oats	1 part ,, ,,
Flaked maize	1 ,, ,, ,,
Cod-liver oil	$\frac{1}{10}$,, ,, ,,

From 5 to 10 weeks

Weatings	3 parts by strike measure
Home-milled bran	3 ,, ,, ,,
English barley meal	1 part ,, ,,
Maize meal	1 ,, ,, ,,
Sussex-ground oats	2 parts ,, ,,
White fish meal, or meat-and-bone meal	1 part ,, ,,
Alfalfa meal, or clover meal	$\frac{1}{2}$,, ,, ,,

Note. Although a strike is a bushel (four pecks), it is also an instrument with a straight edge for levelling a measure of grain, meal, and the like, scraping

off what is above the level of the top. When filling a receptacle with meal, shake the contents before striking off or levelling the top, to prevent air pockets.

(*Observations.* Withhold cod-liver oil until the sixth day; then begin with a few drops only. When changing the meals do so gradually, but complete the change within a week. Watch the chickens carefully to observe what effect any change may have on them. If they are eating freely it should not give them a check; that is, their appetite should be keen. Any refusal to take the food, or any undue bowel trouble, means that the change is not suitable; hence return to the original mixture. Barley meal and bran may have a slight loosening effect at first. Alfalfa meal or clover meal is beneficial when there is a shortage of green food.)

Suitable Receptacles

The chicks' grain at first should be given to them from a tin lid such as I mentioned for the mash, or from a very small V-shaped wooden trough, over the sides of which they can easily put their heads; I prefer the open to the barred or otherwise protected appliance for the purpose, because while a chick may walk over the grain or even stand in the trough for a moment, others will see that it does not stay there too long, and it can readily get out, which is not always the case with such young birds which get through the bars or openings in search of food. Until they do take their meals with a relish, it is advisable not to scatter any food on the ground; and in no case should wet mash be put there, as it gets polluted by being trampled—a piece dragged out of the trough is generally eaten at once. Food which is left about, as some may be at the start, almost invariably attracts rats and other vermin, and encourages sparrows and other small birds to visit the run and become a thorough nuisance. I have said that chicks should be fed inside their coop to begin with; but unless the weather is such as to keep them indoors, they could be enticed out after the fourth or fifth day by putting the food trough into the run, but practically just outside the door, so that it is in full view of the birds.

As I mention elsewhere, it is a good plan to have a small wired pen, a miniature scratching shed, attached to the coop—even to the double compartment one—for the first two or three weeks, and longer in the early season. It enables the chicks to become thoroughly accustomed to fresh air without any fear of their getting wet. There is then, of course, no probability of the birds being unable to find their way back to the coop, while they will rarely stay out long enough to catch cold. They have sufficient sense to keep inside when the wind blows. Just one caution; see that the drop from the bottom of the door to the ground is not such as to prevent their getting in again when once they have been outside. Put a step of some kind down if necessary.

During the second week the wet mash can be gradually brought up to full strength as it were, and the chickens weaned from bread and milk. When making this change I mix the "sop" with the first two or three meals of mash, that is, they contain a small quantity of brown bread, and this soft food is prepared with milk—milk can be included in all mashes for young fowls, and, when mixed with water, the amount used makes little difference to the milk bill. Still, water will do. Animal protein (fish meal, etc.) can be included before the fifth week if necessary

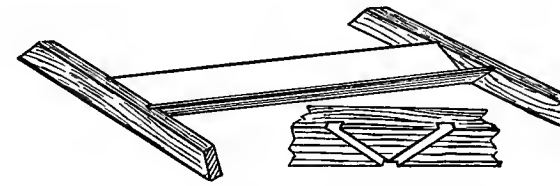


FIG. 130. TROUGH FOR WET MASH

The wet mash trough should be fairly wide across the top, and shallow, with the ends no higher than the sides. It must have long and heavy end pieces to prevent its being turned over should any bird stand on the edge to feed

—it is certainly so in very cold weather—just a flavouring at first.

This wet mash must be thoroughly mixed to be palatable; and there must be no lumps in it. Make it so that it would break easily if a handful were dropped on the floor. All the ingredients must be sound, because sour and poor quality foodstuff does not give the birds a chance to thrive. The wet mash should be made freshly for each meal; and it is best supplied to them from long narrow wooden troughs, varying the sizes according to the age of the chicks, the first one being shallow, so that they can get their heads over the sides. They must be of sufficient length to prevent the birds fighting for a front place. At one time I used a French feeding stick or a board for the first few meals of wet mash; but the chicks were apt to trample on and foul the meal.

Number of Meals

During a cold spell in winter and spring I have frequently continued with the bread and milk breakfasts as long as the chickens were with the hen. Warm as they undoubtedly are when she broods them, they appreciate this light and nourishing diet after their long night fast, as it is given to them while it is still in a warm state. In no circumstances, however, should mash be put before them when it is hot; and even on the coldest morning it should be just warm. Hot

mash may appear to be as comforting to such young birds as hot coffee is to some people; but it is so comforting that it overheats chickens and almost invariably makes them so drowsy that they stand about and catch cold. It has for years been the idea that during the first week or so chickens can hardly have too many meals; but I long since learned the folly of trying to coax them to eat once every hour in their "baby" stage. Experience has taught me that, in this system of feeding, they should be accustomed from the first to get their meals after fairly long intervals, because any attempt at over-feeding leads to loss of appetite. If growth is desired the appetite must be keen.

Chickens at liberty certainly take their food with a relish if the intervals between meals are such as to permit of proper digestion. There must be no starving, of course; but, although the crop of a chick cannot hold much food, what little it does hold has to go through all the process of digestion—the process of dissolving aliment (food) in the stomach and preparing it for nourishment—and its crop and gizzard have to be considered as well as its stomach. Chickens thrive well on four meals in the daytime; but, in the very early season, they may safely have one, or even two, at night by artificial light. At all stages they should break their fast reasonably early (never later than 8 o'clock, but an hour before that for preference), while their last daylight meal should be put down for them half an hour or less after sundown, according to the season. Very early feeding is particularly necessary during the short days, because the interval between supper and breakfast is a long one. Hence the benefit of night feeding. It may be troublesome at first to get them sufficiently awake to eat; but a little patience will generally be rewarded.

As a change in winter, but not as part of the every-day diet, the grain may be boiled and air-dried, or soaked in water for two or three hours; but care must be taken that it is not overdone. It is beneficial if there is any tendency among the chickens to leave the usual quantity of hard grain. This, after the first week, should be sprinkled on the ground or the litter in a clean spot at the set feeding times; and it is decidedly preferable to mixing the daily supply with the litter to let the chicks get it when they like. Such a method as the latter makes foul eating and induces the birds to waste much of the grain. The feeder must be very careful to keep mouldy or musty grain, or decomposed food, out of the reach of chickens. Grain or meal which has been heated in the bins, allowed to get damp and mildewed, rat or mouse polluted, or weavilled, is not for them. The best is always the cheapest in the end. Let me repeat that it is difficult for other than the attendant to fix the exact quantities of mash and grain for each meal, because he alone knows his birds; hence after giving them a few meals he should have gained a good idea of their requirements. When chickens are being fed on the grain and wet mash system, therefore, the "art" of chick feeding amounts to nothing more than giving them sound food at regular times, and providing them with sufficient at each meal to make them contented but always ready for the next.

The feeding times should be fixed, and at as regular intervals as possible, although, as can be understood, when chickens have a wide range the quantities given to them at the second and third meals could be reduced. Breakfast and supper are the meals which should be generous ones in those circumstances, because a full breakfast will never prevent chickens going in search of other food—or mischief. As a guide to the beginner, therefore, the following programme should prove useful as it has done to thousands of novices who have sought my advice on the subject.

FEEDING TIME-TABLE No. 1

First Day in the Coop

Withhold food and water; leave the chicks to the hen.

Second and Third Days

Offer the chicks bread and milk at 7 a.m., 12 (noon), and 5 p.m. Let the container remain down for half an hour each time; prepare the "sop" for each meal. Put a small pan of fresh water before them with their breakfast on the second day, and from then onwards see that fresh clean water is always available.

Fourth and Fifth Days

Bread and milk at 7 a.m., 11 a.m., and 3 p.m., and grain (in a trough) at 6 p.m., or earlier, according to the season. Tempt the chicks out on the fifth day.

Sixth and Seventh Days

Bread and milk at 7 a.m. and 3 p.m., biscuit meal, etc., mash (containing a little bread and milk) at 11 a.m.; grain in the evening. If the chicks have not access to grassland, flavour their mash with onion, or place before them, in a tin lid or a trough, a very small quantity of finely-minced raw lettuce, a leaf or two of perpetual kale or spinach (the tender shoots), or sprouted oats. Granted they take this green food readily, let them have it daily. Put it down with the second meal of the day and remove it as soon as it appears to be limp. Grass is, of course, ideal green food, and probably better than most vegetables; but those mentioned are excellent substitutes.

Second Week

Bread and milk at 7 a.m., gradually weaning them from it; sprinkle grain at 11 a.m., and in the evening, and give them wet mash at 4 p.m.

Third Week

Wet mash at 7 a.m. and 4 p.m.; grain at 12 (noon) and in the evening.

Fourth to Sixth Week

Increase the intervals between the daylight feeding times if possible; and at the beginning of the fourth week start with night feeding, if necessary. Let the chickens have wet mash for the first and third meals and grain at other times. The soft food can be varied, and some English barley meal,

maize meal, etc., can be gradually worked in as a change. Whole wheat can be put down with the kibbled and cut grain, or a good brand of chicken mixture towards the end of the sixth week, all grain until then being kibbled or in the form of seed known as dry chick food. Be careful not to overfeed the birds, especially at three to four weeks; and make them work well for what grain they get.

Seventh Week Onwards

Feed not more than four times daily until the sixteenth week, gradually reducing to three meals *per diem* until the birds are six months old, when they should be fed according to the object in view.

When chickens are seven to eight weeks old they can scarcely be overfed; hence the four daily meals they get from that period onwards should be generous ones. Short clipped oats—always clipped, even for adult stock, and plump grain, too—may be given alternately with wheat and other corn from about three months, starting at ten weeks by mixing half a measure of oats with an equal quantity of kibbled maize and two measures of wheat. Few chickens take kindly to an all-oat diet unless they have become accustomed to the grain in a mixture. There is no need for me to stress the necessity of making any change in the food, and especially in the corn ration, gradually and not abruptly.

It is, of course, the same when changing from cut or kibbled wheat to the whole seed—always get them familiar with it by mixing some of the whole with the other. My experience is that sudden changes almost invariably cause a check in the feeding, in that the birds have to be starved into eating that which is novel to them. This is not beneficial, since for proper growth the chickens must enjoy every meal they get, and take their food regularly.

Under the Hover

It is probably true that anyone who is gifted with a little common sense can rear chickens, more or less successfully and with the minimum amount of trouble, when a hen has charge of them. It is not until the other way is attempted that real worries commence. Certainly, on the whole, artificial rearing in its smallest form is not so simple as the natural method; and perhaps the most difficult part of it is concerned with feeding, not only the system but the actual food, and particularly if the birds are being kept intensively. When chicks are ranging with a hen in the garden or on pasture land, they get from the soil much that is denied to those which are being kept confined to a brooder house or sun parlour. Admittedly, when the small unit system of artificial brooding is in vogue—or, indeed, any other method of ground rearing which permits of outdoor exercise—the one is almost as beneficial as the other; but the naturally-reared chickens have the advantage of being on land which is not likely to get "chicken-sick," while the hen can, and does, by her vigorous "digging," find for them much mineral and other food which no chick could discover for itself.

Mineral salts are to be found in most soils, while pasture land often contains iron and lime, and nearly always iodine. All these essentials for growth, if not for life itself, are obtained by naturally-reared chickens. That is why, although we have become familiar of recent years with balanced rations, vitamins, mineral salts, and what not, in connexion with chicken dietary, the nutrition experts have naturally not considered it necessary to give a thought to the food for hen-reared chicks. On the other hand, they have rendered, and are rendering, excellent service by their experiments in the matter of diets for artificially reared birds; and although at times their findings may be expressed in language which is beyond the understanding of the practical poultryman, much good is being accomplished when, as so often happens to-day, the research worker and the field worker combine in their investigations.

In early days, when only small broods of chickens were being reared artificially, the hover made little difference to the method of feeding; but, when numbers increased and hundreds had to be reared together, it was patent that what answered for the few could not be applied to the many to keep overhead charges to the minimum. For instance, while it might not be a great task to prepare bread and milk for 200 to 300 chicks in small batches, twice or thrice daily—and I have seen such numbers so fed in quite recent times—it does not pay to do so when the flocks are large and numerous. On the other hand, there are those who say the same of wet mash feeding—that it does not pay to prepare this food for chickens—with which I do not agree. Nevertheless, many poultry-farmers have found it necessary to go in solely for the "dry" system of feeding, some using dry mash only, others combining dry mash with grain, and a few giving their chickens nothing but grain. The middle course is undoubtedly the most popular when dry feeding is adopted; and yet at certain stages of growth I find a combination of dry and wet the best of all.

Dry Feeding

Some advocates of the dry method declare that it is much superior to any other way of feeding, even for the production of market chickens. So it might well be, in their case, because of a truth circumstances alter cases. I have tried them all, and each has its uses; but I have, so far, not found any better system for large broods than such a combination as I suggest. Professional fatteners—men who cram and finish table fowls for the best London trade—have often declared

to me that chickens which are reared on the dry mash system of feeding do not prove as satisfactory in the fattening coops as those brought up by the wet mash method. It can scarcely be that the sudden change from dry to very wet mash prevents their feeding well; so crop capacity is said to be the stumbling-block —dry feeding produces a tight crop, which has to be stretched by special feeding before it can take the extreme limit of the fattening mash, and this delays the birds a week or more. Such, at any rate, is the general belief among fatteners.

When handling large batches of chickens I find that dry feeding does lighten one's labours in a sense, which about counterbalances the wastage of food; because, say what one may in its favour—and it has many good points—the giving of grain (either as "scratch feed" or "dry chick feed") and dry mash (given dry, in hoppers which are always open) does generally result in both kinds of food being wasted. I have tried different styles of hoppers and troughs for dry mash, with grids, holes, and lips; but, so far, I have not found one which prevents some chicks wasting some of the mash when they have become accustomed to food in this form. The dry system, let me explain to the beginner, consists of supplying the chickens with grain at stated intervals and keeping dry meals of various kinds almost constantly before them with, of course, water and green food handy. The grain is scattered in the litter and the dry mash is put into a trough or a hopper.

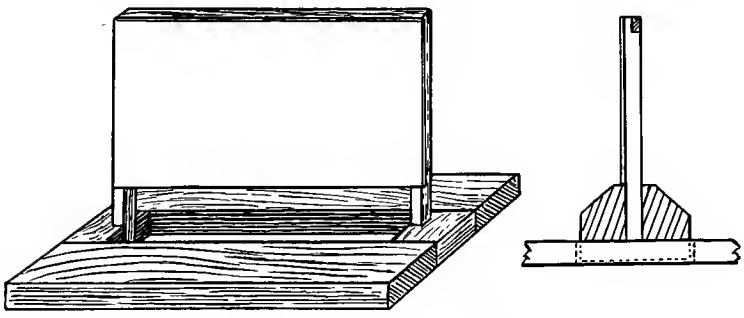


FIG. 131. DRY MASH FEEDING

The frame (left) for the first-stage dry mash trough. When it is in position the centre, of three-ply wood, fits across the middle of the trough, lengthwise—as seen in the end section, right—and thus prevents the chicks walking over or standing on the food

The former is a simple appliance, generally oblong-shaped and fitted with a grid, or an apex-shaped top with holes, through which the chicks put their heads. This second type of trough is about ideal in preventing the birds pulling food over the sides with their beaks; but, unfortunately, it does not prevent the smallest chicks getting inside and fouling the food, or the largest from perching on the apex. Even when the gridded trough is made with lips over each side and the ends, some birds seem to delight in scattering the mash in search of particles they fancy. The hopper is a combination of container and trough and is so made that several days' supply of food is available —the plain trough, I might add, holds only enough mash for a day. When the hopper is in use the food is supposed to run into the trough as the birds eat, so that a constant supply is on hand. Sometimes, however, the mash refuses to enter the trough; and unless the attendant is ever on the watch, the trough may be empty. The advantage of the hopper over the plain trough is said to be that it saves labour in replenishing, and always ensures fresh food.

I long since discarded the hopper in favour of the trough, because the latter forced me to see to the mash daily—which is beneficial to the chickens. Placing dry mash in the trough once a day means that the food is always fresh and, thus, appetizing. I like neither the big hopper for dry mash nor the large water fountain for chicks which are being brooded, although they may be handy in the growing stage or, rather, when chickens are off brooder heat and ranging outside—because the actual growing stage starts at seven to eight weeks, even though some breeders do not give their birds "growers' mash" until a fortnight or so later.

Different Feeding Vessels

It is essential that the vessels used for dry mash—and water, too—which are inside the brooder house, are such as keep waste to the minimum and prevent either food or drink getting contaminated. The latter is easily managed, as I have explained earlier in this chapter. The dry mash troughs are rather difficult perhaps to arrange, but we do it in stages. The first stage troughs used on this farm, those which are put down for the ground-reared chicks for the commencement of feeding, are home-made, straight-sided—not V-shaped—long and narrow and with the food in full view. At one time I used boards for the purpose for the first three days, spreading the mash on them about a quarter of an inch thick—it never does to scatter dry mash on the floor, simply because, by so doing, much will be wasted and fouled. Finding them useless, I tried trays. But, even they did not satisfy me, because if twenty or thirty chicks attempted to feed from one board or tray, as frequently happened, it resulted in far too much waste and foul food. The birds invariably swarmed over them when first put down, so that few got a chance to eat, while others mistook the mash for a new kind of litter on which to slumber. Even when the food was put on the centre of the board, and plenty of foot room was allowed, it did not improve matters.

It is, therefore, somewhat surprising to find that this way of providing chicks with dry mash is still being advocated; it does more harm than good. Hence, my adopting a trough and getting the chicks accustomed to clean feeding from the beginning. The board or tray had to be scrubbed clean daily; in fact, I found that a clean one was necessary for each meal. The trough keeps clean, because to prevent the birds getting into it, or perching on the edges or ends, a piece of three-ply wood is fitted over it on edge down the centre and fixed to a frame which consists of a handle and a stout wooden base. The frame is very quickly removed, so that the refilling of the trough is an easy matter. When the chickens are forward enough to perch on the handle—and they generally are so, at about a fortnight old—other receptacles are provided for the mash. These allow rather less than one inch a head of frontage, both sides of the trough being available; and one trough, 2 ft. long, will be ample for fifty chickens until they are transferred to their "growing" quarters.

For ground rearing, as distinct from wire floors, I prefer this length of trough to any other made of wood. It is more rigid than one made for 100 chicks; it is more easily handled; it helps to break up a mass of chickens into small batches at feeding time—the troughs being placed on different parts of the floor—and provides an opportunity for all the birds to get their food without any bullying; it ensures the mash being fresh and appetizing; while the fact that the troughs are placed in different parts of the house induces the chickens to eat more, since, being by nature somewhat inquisitive, they wander from one to the other during the meal. Several troughs rather than one trough for a very large batch of birds keep them more fully occupied. As, however, this trough is not a hopper and is completely open, it is fitted with a revolving bar down the middle, part of a broomstick, or any straight piece of 1 in. by 1 in. wood with its edges bevelled and a screw at each end, let into a hole and a slot, similar to the hanger for a roller towel. Thus, when a chicken alights on it, the bird remains for only a second or so, because the bar prevents perching; but, strange though it may appear, some of the youngsters seem to treat it as part of their daily exercise to attempt perching thereon. As it is, there is no foothold.

An Early Meal Essential

Care is taken to leave sufficient head room for the birds to eat in comfort; but the rod is so placed that they cannot settle on the edges of the trough, and, therefore, the food in it does not get fouled. These small appliances—like the jam-jar water container—may entail a little extra work; but they have been adopted because they are most effective, while their use makes it imperative to put fresh food and water down at least once *per diem*. This can be done when the first daily meal of grain is given; and the mash may safely be withheld for an hour. My plan is to remove the dry mash troughs at breakfast time for refilling, and to put in enough food to last for twenty-four hours or more. This is very much more important than may appear to the casual observer. Chickens are early risers and, it appears to me, more so when they are being artificially reared than when with hens. Admittedly, these latter are not always satisfied to remain in the coop of a morning when the sun is up; and, given the least opportunity to escape, they will wander forth. As a rule, though, those in brooder houses are up and doing long before the attendant arrives with their first grain meal of the day—unless he happens to belong to the old school poultrymen, who live for their birds.

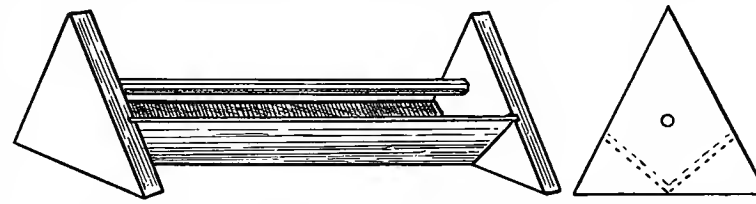


FIG. 132. MASH FEEDING

The second-stage dry mash trough, with revolving rod to prevent chickens perching on the edges. The end pieces must be of thick wood to keep the trough rigid; and apex shaped, otherwise the birds are apt to rest on them and foul the food

It is during the early morning hours that chickens are apt to get into mischief. Therefore, to let them occupy their time usefully, it is my custom to see that dry mash is left in the troughs at night, so that they can have a meal and go back to the hover again. Some chick rearers mix grain with the floor litter for the same purpose; but it always strikes me that grain so left is apt to get polluted. Others fit their brooder house windows with dark blinds, which are pulled down in the evening and not drawn up until breakfast time. Presumably this is done to encourage the chicks to settle down in the hovers until the feeder arrives the next morning, and to prevent any rays of sunlight which may enter the house enticing the birds from the warmth of the hover—to perish outside in the cold. I have never tried this darkened house plan, and I cannot think it can be good for the chickens' eyes, although it must be thirty years or more ago since I first saw it in use, on a Hampshire poultry farm. Blinds may serve a good purpose; but I doubt it.

A friend of mine who uses them assures me they enable him to see that all chickens are settled for the night before it becomes quite dark, and that they

remain settled until the blinds are drawn up next morning, while as they do not admit sunbeams the chicks keep to the hovers. Chickens are greatly attracted by sunlight; and, except that rays of sun coming through a very small aperture and forming spots of light on the ground may perhaps lead to the birds crowding there, I am not keen on keeping the sun out. Sunlight is most beneficial to chickens, as it is to human beings; and, on the whole, too little use is made of it in the modern method of brooder house rearing. During the many years I have been rearing chickens I have not found it detrimental to allow the birds the maximum of sunlight and fresh air from the first; and even in winter, when they may have to be kept indoors for weeks on end, I take care to see that the air in their house is never close and foul or stuffy.

It is to provide them with an excellent substitute for sunlight that cod-liver oil, with its D sunlight factor, is so beneficial in winter, when cloudy weather prevails much of the time. The birds will get from the hover all they require in the way of warmth at night, while the guards around it for the first few days, as I have already mentioned, will teach them where to go when they need it. Given their freedom of the whole floor, they will use it to the full, provided the fresh air of the house is not a swirling draught. Exercise in sunlight and fresh air, such as a properly located and well-ventilated brooder house provides, encourages them to eat well, enjoy their food and to thrive. Sunlight can be detrimental only when fresh air is lacking, when the attempt is made to treat chickens like hot-house plants.

Dry Mash Feeding

As I have remarked, when birds are being artificially reared their numbers are such that the preparing of bread and milk and wet mash is generally considered too much of a task, hence the dry system. An exception might perhaps be made if fireless brooders are in use; the birds could probably then be fed as they are fed when with hens. But for other systems, whether they be small outdoor rearers, single hover cabins, or brooder houses, dry mash is undoubtedly a labour-saver. For such chickens as these, also, unless they are allowed out of doors, more variety in the way of mash, as well as grain, is required, because the endeavour is to provide them with a diet which includes, as far as food can provide, those small and essential items they get from a good range. The idea underlying ground rearing, whether indoors or in the open, is to enable the chickens to get the maximum of exercise for their limbs. Under the most modern conditions of chick rearing on wire floors, the legs and wings of the bird are not used to anything like such an extent as is possible otherwise; the chickens cannot scratch with their feet, and the only times they use their wings are in attempts to flap them, because flying is out of the question. With that subject, however, I shall deal before concluding this chapter.

I remember a well-known breeder of pedigree poultry recently remarking that the man who invented the idea of placing dry mash before chicks all day long did not know the first thing about sound, natural principles, and that he should be locked up. I held the same views myself at one time, and did not hesitate to say so whenever the opportunity arose. That was before dry mash feeding was understood, and before the nutrition specialists came to our aid. Another well-known authority, a commercial poultry-farmer, gives his chickens nothing but dry chick food for the first three or four weeks, at which age dry mash is allowed *ad lib.* An essential part of these rearing methods is to keep the chicks busy and active throughout the day; and both of these breeders find difficulty in doing so when dry mash is always before the birds at the commencement.

The commercial poultry-farmer in question has found that an attempt to force the chickens along rapidly by providing them with unlimited food—i.e. dry mash always available—invariably fails in its object, as the birds soon get surfeited, go off their appetites, and eat less than ever. The pedigree breeder uses grain chiefly—"its effect is definitely hardening, whereas mashes are softening"—and yet his chickens get some wet mash and dry mash, although the latter is before them at specified times only and not all day long. I have often been asked whether dry mash should be available at all times, so that the birds can eat when they like and the amount they fancy. I have just shown how one prominent breeder provides his chicks with dry mash at certain times of the day only, while another, equally successful at rearing, lets his birds have it only after they are three to four weeks old, and then *ad lib.* I have tried both ways, viz. specified times for dry mash feeding and keeping the food always before them; and, as far as my own systems of rearing are concerned, I have no hesitation in saying that the latter is preferable, but with certain reservations.

When to Provide It

When our chicks have become thoroughly accustomed to eating mash in this form it is left before them most of the day, and all through the night, except for certain periods before grain is put down for them and during the time they are exercising for that food. That chickens should be able to get food in the very early hours of daylight is especially

necessary during spring and early summer, when they leave the hovers long before their attendant can be reasonably expected to be with them. That some poultry-keepers do, however, make an early start is evident, because in a letter I had from a correspondent in Scotland last mid-summer, he mentioned his time-table for feeding his 16-week-old pullets as follows: Breakfast 5 to 5.15 o'clock wet mash; 8 a.m. whole wheat; 12.30 p.m. whole oats; 5 p.m. whole wheat and kibbled maize; dry mash hopper open all day.

Nevertheless, having regard to the dry feeding of brooder chickens, I find that as the birds do appear to have some power of discrimination in the matter of diet—for instance, in refusing to eat such grains as hemp, lentils, and peas when put into a dry chick food—so they undoubtedly have the sense to leave the dry mash trough when they have satisfied their appetites. I am so certain of this, because when rearing chickens on wire floors on the all dry mash system, I have never so far had a case of indigestion among them, or a bird fall sick through over- or under-eating. I have suggested that those who would succeed at chicken rearing should feed with the eye as well as the hand. Never is it more necessary to do so than when giving the birds dry mash. Very careful supervision is essential. It does no harm to let the chicks go hungry for a little while each day. But if by such means the appetite is rendered too keen, then the chicks will undoubtedly gorge; or even if only a short meal is put down for them, they will eat it far too quickly, with disastrous results.

It is altogether different when wet mash is given to them, or when the grain is scattered; in the one case the food is sufficiently moist to be easily swallowed, while in the other the chickens have to get their grain by exercising and by picking up one seed at a time. I have watched extra hungry chickens at a dry mash trough; and it was distressing to see the discomfort it caused them. Hence, when they get used to it, keep the dry mash before them for the specified times and trust to their instinct. They will eat it only when they want it, and not when they are ravenously hungry. The only occasions on which I should cover the dry mash troughs, or remove them out of their reach, would be if the chickens went off their appetites and merely picked through the mash or practically left it alone. But if this happened, it would indicate to me that something was wrong with the food, or with my method of feeding. It has not occurred yet; and I have been rearing chickens on the dry mash system for a considerable time. It is not likely to happen, if the attendant be careful to see that the mixture is of the right kind and the food always fresh.

Put it down once daily as I suggest, fresh each morning so as to ensure freedom from staleness; and always plenty of it to last the chicks for the rest of the day and early the next morning. Occasionally, also, run a finger through the meal to alter the surface of it, by moving some from the middle to the sides of the trough or *vice versa*, because this generally improves its appearance. In any case, though, when it is for baby chicks, entirely empty the troughs for refilling, giving the remains to more advanced birds, or to the adult stock. Some of the mash will probably be knocked out by the birds; and this is often so, if it contain lumps of dried milk or particles of broad bran for which most chicks have a preference. But there will be a certain amount of waste; so, as it cannot be cured it must be endured. I have put the troughs on large platforms—they must always be out of the way of litter, when the birds become accustomed to the food—and at the end of the day recovered the waste. Candidly, though, such economy was not worth while.

Fresh Food Essential

The importance of fresh food for chickens cannot be too carefully considered. Dry mash must be free of sweepings, hopper dust, and rubbish; all the ingredients of it must be sound and of the best quality. Any food giving off a musty odour must be rejected; but there is a vast difference between mustiness and the smell of dry mash containing cod-liver oil, fish meal, or meat meal. And, let me remark, when mashes do contain any of these ingredients, as many mashes do, the quality of freshness is of added importance. However, there are several excellent brands of chick mash on the market; so it will not be difficult to make a selection. These commercial mashes cost more than those made at home; but unless the feeder is adept at mixing and blending a dry mash, which means mixing all the components of it in such a way that none stands out—a by no means easy task when large quantities of it have to be prepared—it is preferable to use a proprietary brand or to let a reliable firm which specializes in poultry foods prepare it to a given formula. The only alternative is to rig up a dry mash mixer and do some hand turning. It is a very dusty job.

It is a matter of some importance that all the ingredients are as near the same grade as possible, so that the birds shall be induced to eat the whole of it and not, by selecting the choicest morsels and leaving the rest, upset the balanced ration which has been so very carefully prepared for them. That is the fault of some of these highly-balanced mashes—let the chick eat a stray fly, dig up a worm, swallow a mouthful of fresh green food, and the whole balance is upset. It is for this reason that the vast majority of them are suitable only for chicks which are being reared

on the intensive system, and particularly on wire floors, where they cannot get any food except that which is given to them. The mistake is made in supplying them to birds which have outside exercise. To revert to the grades of the ingredients, however, at one time I used a broad bran in the chicks' dry mash, but I am fully convinced that fine bran is much better for the purpose, if merely because it does not stand out so prominently in a mixture. It is thus less likely to be sought for; and consequently there is less waste of other ingredients.

Despite what some authorities assert about the use of bran increasing the percentage of fibre and thus being detrimental, a good sample of it is rich in phosphates—therefore supplying what is essential for growth—while it does much to set the digestive organs to work and to promote regular bowel movement. In my opinion all dry mashes should contain it; bran certainly enters into the composition of every mash which is recommended by the leading scientific and research authorities. Some chicken men even go to the extent of keeping broad bran handy for their birds, as others put flint grit, granulated charcoal, and bone meal in small receptacles; but with these methods of feeding I do not agree, because one might just as well have a separate trough for each item of food which is necessary to form the daily mash. Mix everything they require in their mash, so that, whether the ingredients be few or many, the birds will have to eat what their feeder knows they should get for their well-being. I have seen quite young chicks filling their crops with flint grit; but birds cannot exist on grit.

Feed for Stamina

The man in charge who has knowledge of foods sees that his mashes contain the least possible number of ingredients to suit the conditions under which he is working. He makes his stock mash of such foods as he knows will be suitable for the birds from the first day of feeding until they are furnished; and he makes little change in them. Although the percentages of the ingredients are slightly altered to assist in the growth of the chickens, as few changes as possible are made in the actual foodstuffs; and there is thus no chance of their getting a check by a sudden change of diet. It is because of this that old hands at rearing rarely lose a chicken except by accident. The aim of the rearer of utility stock should be the same as that of the fancier who breeds the poultry which are so greatly admired at the exhibitions—to ensure his birds having sound constitutions. Those who rear pullets for laying should feed their chicks with the object of putting into them, by correct feeding, the stamina which is so essential for steady production over a prolonged period. However strong the birds may be when they are hatched, correct feeding has a very great influence in developing them into "stayers"—pullets which have the constitution to stand heavy feeding during their laying period so that a continuous supply of eggs shall be forthcoming. The bird which breaks down after a brief spurt is useless for the commercial egg farmer, and certainly no good for the breeder of laying stock.

Many rearers fail at the beginning; they attempt to force their chickens with foods which make fat rather than frame and flesh. I have frequently had through my hands, for post-mortem examination, pullets apparently the picture of health but which broke down when on the point of production for no other reason than that, owing to the too free use of fattening foods in their chickenhood, they were physically unable to lay, their oviduct and other internal organs being laden with fat. I am no believer in starvation rations; but I cannot help thinking that the average poultry-keeper makes too little use of the products of wheat, i.e. weatings (the standard name for middlings, sharps, thirds, etc.) and home-milled bran, in his chick mashes. But both are essential; and when they are fresh and palatable, the birds readily eat them.

Good stock mashes for chickens which are being ground-reared by artificial means and are not kept entirely confined to the brooder house, mashes which are used in conjunction with grain as previously mentioned, are as follows—

DRY MASH MIXTURE No. 1

Ingredients	From 1 Day to 5 Weeks	From 5 to 10 Weeks
Home-milled bran	12	8
Weatings (middlings, etc.)	8	12
Sussex-ground oats	8	6
Maize meal	2	4
White fish meal	1	¾
(All parts by weight)		

These are what can be termed simple mixtures, which have been used with success for chickens in a brooder house; and this method is one that can be adopted with ease by the novice. As a rule, the chickens are off brooder heat long before they are ten weeks old and settled in their rearing quarters, that is, accommodated in arks or colony houses; but I find it beneficial to continue feeding them in their new quarters for the first two or three weeks with the dry mash to which they got accustomed in the brooders.

There are, of course, several other mixtures suitable as dry mash; but only two more methods need be

mentioned. One, recommended by the Ministry of Agriculture, is as follows—

DRY MASH MIXTURE No. 2

Ingredients	From 1 Day to 5 Weeks	From 5 Weeks to Maturity
Weatings (middlings, etc.)	4	4
Home-milled bran	2	3
Sussex-ground oats	2	2
Maize meal	1	1
Meat meal or white fish meal	1	½
(All parts by weight)		

It will be noticed that in the above first-stage mash (up to five weeks) the fish meal equals 10 per cent, while in the No. 1 mixture it is only slightly more than 3 per cent; but less weatings and Sussex-ground oats, and more maize meal are used. In my opinion the percentage (10) of fish meal is too high for use in the normal rearing season; but it should be suitable for winter feeding.

The other method is the one adopted at the National Institute of Poultry Husbandry, Newport, Shropshire, and is as follows—

DRY MASH MIXTURE No. 3

Ingredients	Chicks (All Mash) 0–10 Weeks	Growers 10 Weeks to Maturity
Yellow maize meal	40	20
Bran	20	30
Thirds or middlings	12	40
Sussex-ground oats	10	—
Extracted soya bean meal	5	10
Dried skim milk	5	—
Meat meal (60% protein)	5	—
Common salt	½	1
Ground limestone	1½	2
Cod-liver oil	1	Only if confined, 2%
(All parts by weight)		

For the first period (up to ten weeks) the chicks get dry mash only, but from "ten weeks to maturity" (i.e. to the laying stage) the mash is given in conjunction with a grain ration of equal parts of wheat, oats, and barley or kibbled maize. When I wrote to Mr. I. W. Rhys, then Senior Research Assistant at the Institute, concerning these mixtures, he assured me that the standard procedure is to start on the "all mash" (0–10 weeks), but to give the birds "scratch and mash" from ten weeks to the laying stage; and then, if an all mash diet is to be adopted for egg production, the change is made when the birds are brought to the laying house. The grain ration must be allowed from ten weeks onwards; the all mash ration given for chickens (0 to 10 weeks) has been used satisfactorily in the battery brooder. These rations, I am assured, are safe to give to pullet chickens which are being reared for future egg production, as they do not force the birds ahead too quickly. Cod-liver oil is not included in the growers' mash if the birds have a wide range or they are getting plenty of sunshine and being allowed to run outside continuously. It is, however, essential in other circumstances, and, as stated, as high as 2 per cent level. Chickens which are being reared for eggs require relatively slower growth than those intended for table production.

When to Start Feeding

It must be remembered that chicks do not require feeding until a day after they are under the hovers. When putting down their first meal it may be necessary to tap on the floor or the trough with one's finger nail to attract them to their food. Healthy chickens, nevertheless, should know how to eat—and drink. As a rule it is enough to show them food and water; and, as soon as the first meal has been given, water vessels should be placed where the birds can easily find them, while from that time water should always be on hand. "Feed little and often" is said to be the slogan for brooder chicks which are confined indoors for the first few days. The first meal is offered to our chicks as early as possible in the morning of the second day they are under the hovers, unless they have been kept for the best part of a day in the incubator room, in which case they get their first meal the following morning. The guard is removed, a section of the curtain is lifted, and the litter scraped away so that parts of the floor are left bare. On these the food is placed; and since, with large batches of chicks, it cannot be bread and milk, I give them dry mash from a shallow trough.

At times I have started them with dry chick food, or a mixture of pinhead oatmeal, finely crushed chick flake (partly cooked wheat and maize) and finely kibbled wheat, and have withheld dry mash until the middle of the week; but, as they need very little food at this stage, I think it is better to begin with dry mash. This is left down for about ten minutes at the start; for the first three or four days it is put before them three or four times daily, the time it is down being increased until eventually it is removed only before they get grain. Dry mash is a food which cannot be eaten quickly at any time; hence there is little fear of chicks in their very earliest days getting more of it than is good for them, when the troughs are down for so few minutes. From the first day of feeding, however, grain is given towards evening, and, at the beginning, it is put on bare parts of the floor.

As soon as they know how to use their legs, I let them have, for one meal, as much grain as they can find in about half an hour; but as it is always, then, scattered to encourage all of them to work for the food, it takes them quite a long time to get a cropful. It is at the beginning that the novice will be worried about the quantity; but, generally speaking, if he puts down a very small handful for a hundred chicks he can get a good idea of about what is required. Some rearers mix a little fine limestone or oyster shell grit with the grain or dry chick food, a handful of it to a bucketful of the grain. This is decidedly better than putting it in a separate container, as they cannot then gorge it. However, if they want grit they have to find it when they are let out, because I do not provide them with it.

The birds will be kept on the hungry side—which some authorities declare to be the only way to feed chickens—by offering them dry mash as I suggest; but they should always end the day with full crops. Dry mash should never be left before them all day from the beginning. Some chicks may have the sense to take a good meal and then wander from the trough for exercise; but there are those which would stand around gorging and thus upsetting their digestion. They must be trained to the dry mash system; and this means that the food should not be before them for more than about ten minutes at the start. Admittedly, when they get accustomed to it, they will feed only when they require food, like adult fowls. Keep an eye on them, therefore, at first; and never at any time forget to give them fresh food each morning. The man who is handling large flocks is no novice; he has been initiated into feeding while dealing with small broods. But it is most unwise for anyone who has not gained such experience to attempt big things, for thus will he fail, as others have done.

Granted we all make mistakes at first, although there is far less excuse for mistakes now than when I commenced keeping poultry. My object in setting out time-tables and food mixtures in as plain a manner as possible is to help the novice to keep his mistakes to the minimum. He is saved some anxiety and labour by adopting the grain and dry mash system, because, once he has got his chickens accustomed to the food, he will not have to worry about arranging alternate daily meals for them "a little at a time, and often"; or giving his birds enough without overfeeding to keep them satisfied but rather on the hungry side. Nevertheless, it is folly to imagine that only once daily is all the attention chickens require while they are in the brooder house. Even in the matter of grain, when they know where to find it, the rations should be so given that they cannot clear it in a few minutes but will have to spend some time seeking for enough to satisfy them. It is practically impossible to state definitely the exact quantity of grain which should be given to a flock of chicks of any specified size or age; and this is a matter in which the feeder has to be guided by his own observations of the youngsters.

Gauging the Quantity

After they have had two or three meals of it from bare patches of the floor, especially if the grain or dry chick food be sprinkled about and not put down in a heap, they will have learned how to scratch. After all, it is a natural instinct which artificial methods have not ruined; and even chickens which are brooded on wire floors never hesitate to indulge in it as soon as they get on the ground. Covering the grain with a thin layer of the litter could be tried at first; but I always scatter future rations in such a way that much of it falls below the surface. Some writers suggest that the seed be raked into the litter; but they cannot have used a rake in a brooder house with a hundred or two chicks swarming over the floor, doing their best to get that which is in view. The very sight of a rake is apt almost to shatter the nerves of the birds. I once attempted to put the breakfast allowance of corn into the litter the previous evening, much as I dislike food being so left; but, perhaps because I was clumsy, the noise brought the chicks from under the hover, and I had quite a bother to get them back. I never repeated it; so now I scatter the quantity for one meal as widely as possible, and it keeps the birds busy for quite a long time.

A neighbour who feeds his brooder-house chickens on this system (grain and dry mash) gives his birds sufficient grain to last out until the next meal of it is put down; but there is always a trace of the food in the litter, and consequently, much is wasted. I scatter what I term a short meal of it at breakfast time, when the dry mash troughs are taken up, but almost invariably give them a good meal of it towards evening, to ensure their having full crops before retiring to the hover for the night. This, however, is a matter which must be carefully supervised; and it is always advisable to watch them at their evening meal to ascertain whether they take it eagerly or merely pick it over. Chickens soon lose their appetites and become faddy if grain is left about from one meal to another.

If they do not relish their food at any time—even when the dry mash is before them they should be always ready for their grain rations—I sometimes try a change from dry to wet mash; it certainly sharpens their appetites, but I must admit that it is somewhat difficult to wean them from it. Otherwise, their dry mash troughs are removed for an hour or two,

although seldom is this necessary. I do not believe in giving tonics to chickens; but if there should be any sign of digestive trouble, by all means put a tray of granulated or ground charcoal into their house. All the feeder need do, however, is to study his birds, particularly while they are being brooded. I am averse to coddling chickens, but I always remember that they are young creatures and not adults.

I may be harsh; but, when handling large broods I never bother with delicate and weakly birds. So if any falls sick or does not make proper progress it is killed. Its removal is better for the remainder; and, moreover, terminating its existence prevents its being pecked and having a rough time. The attendant has enough work without the extra worry of seeing to ailing birds. Keep the chickens dry, warm but with plenty of fresh air, and well fed, and all should progress satisfactorily. We old hands know this; when trouble comes our way it is because, ninety-nine times out of a hundred, we have been careless. The novice has to learn the system; he has to get into the way of it. Hence the following table, No. 2, should be of assistance to him. The one previously given in this chapter will act as a guide when he is working along moderate lines with hens. The beginner who attempts greater things and to whom the dry system of feeding is new, will best learn by having everything cut and dried. As he gains experience he can chop and change the food according to his special requirements.

FEEDING TIME-TABLE No. 2

THE GRAIN AND DRY MASH SYSTEM

First Week

1st to 4th day (from commencement of the actual feeding and not from the hour of hatching). 7 a.m., 10 a.m., 1 p.m., and 4 p.m. dry mash for about ten minutes each time on the first day, increasing to half an hour on the fourth day. 6 p.m. dry chick food or finely kibbled grain mixture.

Drinking water, not ice cold, although not heated, with the first meal, in shallow dishes or jam-jar fountains with shallow sides.

Remainder of first week. 7 a.m. and 6 p.m. grain or chick food. 9 a.m., 12 (noon), and 3 p.m. dry mash, half an hour for each meal.

Second Week.

Same times and similar meals as from fourth day: 7 a.m. green food; dry mash troughs down for one hour. From tenth day put dry mash down at night for early morning feeding.

Third Week

7 a.m. remove dry mash; 9 a.m. grain; 10 a.m. to 4 p.m. dry mash; 4 p.m. remove troughs; 6 p.m. grain; 8 p.m. (or when the brooder house is visited to see that the chicks have settled for the night) dry mash for very early feeding.

Fourth to Tenth Week

Same times and similar meals as during third week, until the chickens are ready to be transferred to the range with accommodation in arks, or colony houses.

This transference may be done at the end of the sixth week, unless rearing is being undertaken in the early season, when the weather is cold, in which case it should be delayed for two or even three weeks longer. In these circumstances, however, provide the birds, from the fifth week, with a roosting platform of slats, fixed an inch or so over 1 in. mesh wire-netting, and 6 in. to 1 ft. from the floor; keep it away from the walls (so that it can be reached from any side), and clear the droppings, from underneath, twice a week.

Notes. As the chickens increase their size, provide more troughs and fountains; never forget fresh dry mash and clean water. When green food is provided (it must be fresh, young, and free of water), clear away, by midday, any remains; alfalfa (lucerne) or clover meal in the mash will take its place. See that grain is not left in the litter to become polluted. Pay attention to ventilation; allow plenty of fresh air from the first, but avoid ground draughts in the earliest stages.

If curtains surround the hover, remove them in sections after the first fortnight and get the chickens gradually accustomed to thrive without artificial heat; see that they spread around the lamp at night. Remember to keep the litter reasonably clean; clear it out at the end of the first fortnight, or earlier if necessary, and make such a clearance about twice a month, burning the litter right away or putting it into the manure pit. Occasionally use a vapour spray with a reliable germ killer on the walls and ceiling, particularly in warm weather.

In connexion with the feeding of chickens in brooder houses some rearers favour the combination of the wet and dry methods. Those, therefore, who would like to try the system could adopt the following, which has been found beneficial. It will certainly prove serviceable for winter rearing in Scotland and the North of England, and particularly for general-purpose breeds.

FEEDING TIME-TABLE No. 3

A WET AND DRY COMBINATION

Food		
A. *Moist Mash*		
Rolled oats	8	parts by weight
Stale brown bread crumbs	8	,, ,,
Meat meal	2	,, ,,
Sterilized steamed bone flour	1	part ,,
B. *Grain*		
Kibbled wheat	3	parts by weight
Finely kibbled maize	2	,, ,,
Pinhead oatmeal	1	part ,,
C. *Dry Mash*		
Home milled bran	3	parts by weight
Weatings	3	,, ,,
Maize meal	3	,, ,,
Meat meal	3	,, ,,
Bone meal	1	part ,,

D. *Grain*

Whole wheat	3 parts by weight
Kibbled maize	2 ,, ,,
Whole groats	1 part ,,

E. *Grain*

Whole wheat	3 parts by weight
Kibbled maize	3 ,, ,,

Method of Feeding

First to Fifth Day

A (mash) moistened with skim milk three times daily; B (grain) twice daily in shallow trays; C (dry mash) always before the chickens.

Fifth Day to Two Weeks

A (mash) moistened with sour skim milk, three times daily; B (grain) twice daily in litter; C (dry mash) always before the chicks in troughs or hoppers.

Two to Four Weeks

As from fifth day, except A (mash) twice daily.

Four to Six Weeks

A (mash) once daily; D (grain) twice daily, in litter; C (dry mash) all day.

Six Weeks onwards

C (dry mash) and E (grain) in troughs or hoppers; A (moist mash) once daily if necessary to hasten development. Limestone and oyster shell grit in the grain, ground or granulated charcoal in trays from the start. Water, fresh twice or thrice daily. Green food daily, unless a grass range is available.

Note. The above is a method recommended particularly for cold climates and for chickens which are allowed outdoor exercise from about two weeks of age. The moist mash must be freshly prepared for each meal, the dry mash kept fresh, and the grain, when scattered over the litter, sufficient for one meal to occupy about half an hour.

Feeding on the Fold System

As the fold system of rearing chickens—i.e. rearing them artificially by hovers placed in movable houses with runs attached, so that fresh ground can be allowed daily—is coming into vogue, I give the feeding method of a well-known pedigree breeder of laying stock (Mr. W. M. Golden), who uses chick houses with sliding tops and hovers fitted with curtains, until the end of the tenth week, after which the birds are given free range.

FEEDING TIME-TABLE No. 4

Food

No. 1 Grain (for first four weeks)

Kibbled English wheat (fine)	18 parts by measure
Chick flake (wheat and maize)	6 ,, ,,
Pinhead oatmeal	3 ,, ,,
Rolled oats	1½ ,, ,,
Charcoal	1 part ,,
Mebo (meat-and-bone meal)	1 ,, ,,
Grit (fine flint)	1 ,, ,,

No. 2 Grain (four to eight weeks)

Kibbled wheat (coarse)	18 parts by measure
Wheat and maize flake	6 ,, ,,
Groats	3 ,, ,,
Rolled oats	1½ ,, ,,
Charcoal	1 part ,,
Mebo	1 ,, ,,
Grit	1 ,, ,,

No. 3 Grain (eight to twelve weeks)

Whole wheat	3 parts by measure
Groats	1 part ,,
Maize grits	1 ,, ,,

No. 4 Grain (twelve weeks onwards)

For cockerels: 2 wheat, 1 maize grits.
For pullets: wheat only, except in cold, wet weather, when a little maize is added.

No. 1 Dry Mash (first to eighth week)

Bran	6 cwt.
Sharps	4 cwt.
Sussex-ground oats	3 cwt.
Maize meal	2 cwt.
Soya bean meal	90 lb.
Fish meal	60 lb.
Dried milk	60 lb.
Linseed meal	35 lb.
Cod-liver oil (2 per cent)	19¼ lb.

No. 2 Dry Mash (eight weeks onwards)

Bran	7 cwt.
Sharps	5 cwt.
Sussex-ground oats	2 cwt.
Maize meal	2 cwt.
Soya bean meal	1 cwt.
Fish meal	56 lb.
Linseed meal	56 lb.
Dried milk	60 lb.

No. 1 Wet Mash (for growers from eight to twelve weeks)

Biscuit meal	30 lb.
Bran	30 lb.
Maize meal	15 lb.

Prepare with 6 gallons of separated milk, and dry off with 30 lb. sharps and 20 lb. Sussex-ground oats.

No. 2 Bulk Mash Wet (for pullets from twelve weeks)

Bran (white flake)	6 cwt.
Sharps	2 cwt.
Maize meal	1 cwt.

Linseed meal, 5 per cent, simmered to jelly and mixed in mash. Prepare with water.

Method of Feeding

First Day

About an hour after the chicks have been placed in the hover, a small meal of clean kibbled English wheat and chick flake (a small cooked maize and wheat flake) in equal parts, water, grit—a good handful of fine flint grit is used to a bucketful of grain. One hour before dusk, a similar mixture, but as much as the chicks will clear. These are the only meals given on the first day; they are put on the floor of the hover, the chaffed straw being cleared away for the purpose, and within the confines of the guard.

Second and Third Days

7 a.m., small meal of same grain in litter; 10 a.m., floury bran in shallow tin; 2 p.m., pick up bran; 4 p.m. (or one hour before dusk), grain as on first day.

Fourth Day

7 a.m., grain; 9 a.m., lift wire guard and allow chicks to have full use of the brooder; 10 a.m., dry mash in shallow tins, equal parts of bran, sharps, and ground oats; 2 p.m., pick up tins; 4 p.m., grain, equal parts of first day mixture and No. 1 chick grain.

Fifth Day

7 a.m., same grain as fourth day; 10 a.m., small quantity of chicken biscuit meal, scalded, and dried off with sharps (this meal is spread inside and outside the brooder to entice the chicks into the run); 11 a.m., dry mash as before; 2 p.m., take up dry mash; 4 p.m., grain.

Sixth Day

7 a.m., grain, a light meal in the house litter; 10 a.m., chicken biscuit, scattered about the run; 11 a.m., dry mash, as previously mentioned; 2 p.m., take up hoppers; 4 p.m., grain. Water to drink—first week.

Seventh Day to Four Weeks

7 a.m., No. 1 chick grain; 10 a.m., biscuit meal in grass run; 11 a.m., No. 1 dry mash; 2 p.m., take up mash; 4 p.m., No. 1 chick grain.

From the first week onwards, ½ lb. semi-solid buttermilk, etc., to one gallon of water to drink.

Four to Eight Weeks

Meal times as during second to fourth week, but grain and dry mash altered as set out above under "Food."

Eight to Twelve Weeks

Meal times and food as above, but wet mash No. 1 once *per diem*.

From Twelve Weeks Onwards (pullets)

Grain, very light morning meal, all wheat; five times a week bulk mash No. 2, and wheat again at night. During cold and wet days half wheat and half kibbled maize.

Notes. In connexion with this system of rearing Mr. Golden says that he has used it for nearly twenty years and that it is "modelled as closely on the hen as it is possible to get." He never rears chicks on any form of wire, maintaining that air should come to the chicks from the sides as it does under a hen. For the first four days the hover is surrounded with a circle of ½ in. mesh wire-netting, which comes close to the sides, with a larger space towards the chick opening into the run, just enough to take the drinking vessel, which is a small earthenware lip fountain. This guard is permanently around the chicks for two days, and for the next two days taken up for about half an hour at feeding times, then again placed round the hover to control the chicks fairly closely. It will thus be seen that for the first four days the birds are well brooded.

On all warm days at feeding time the sliding tops of these small brooder houses are left half-way open; the opening can be regulated according to the weather, but as long as the chicks have plenty of heat at the hover, the more fresh air they have the stronger and easier to rear will they be. Before the chicks are shut in at night, the chaffed straw is drawn up to the curtain and a good flame is left, as they need plenty of heat. As Mr. Golden so truly remarks, it is impossible to rear chicks in the early months of the year unless they have plenty of heat at all times, and a great number of birds are lost owing to underheating.

When feeding the birds, the biscuit meal is scattered about the run as an incentive to draw the chicks away from the heat during the day; and since it is a meal of which they are fond, and which they can get fairly quickly on the coldest day, search for the small pieces which fall to the roots of the grass provides them with exercise. It is most important that, after the fifth day, the brooder houses should be moved every day on to fresh ground, as it provides the birds with a fresh interest and keeps them growing. The chicks are never forced out, the biscuit meal being an incentive for them to get out into the fresh air and use their legs and wings in search for food and then in running back again to the heat. On very cold days sacks are used on the run which is attached to each house, to shield the birds from winds, and especially easterly winds. Dry mash hoppers are placed in the runs if weather conditions are favourable, but the chicks are never made to choose between heat and food, as they will always choose heat and thus go back.

Mr. Golden reared nearly 13,000 chicks by this method in 1933; and he emphasizes the fact that fresh ground every day is a vital factor in keeping the birds active and growing in a clean, hard, natural state, while one of the greatest benefits derived from it is that it provides a counter-attraction to the heat of the hover. The chicks can be kept in splendid condition under this method until the end of the tenth week, but at this period they show signs of flagging, hence they are set free to range where they like. For poultry-keepers who can, and will, undertake the folding system of rearing chickens, I strongly recommend Mr. Golden's method, because I do know he produces stock of high vitality.

It is as well to remark that, in all these methods of feeding so far described, it requires a watchful eye and very careful judgment to secure nicely regulated meals. The ideal way to feed chickens is to give them, at each meal, as much as they can clean up without spoiling their keenness at the next feeding time. It is that "much" which the novice will have to ascertain from practical experience.

On Wire Floors

So much then for the feeding of chickens which are being ground-reared during their brooder stage, whether it be naturally by hens, or artificially by fireless brooders, outdoor rearers or under hovers in cabin, brooder house or fold. Many good rearers of my acquaintance, men who are expert at chicken work on a large scale, have stated definitely that they will have nothing to do with wire floors for the rearing of

their birds. I have just mentioned that one pedigree breeder objects to it on the ground that air should come to the chicks from the sides, as it does when they are under hens. Others declare that by such means the youngsters are deprived of exercise for their legs and wings, which exercise, they say, is so very essential for health and digestion.

One of them recently told me that he objected to wire floors because the system of feeding is such that by providing unlimited food the chicks soon get surfeited, lose their appetites and eat less than ever; and that they will eat more and develop the better if they are always eager for their meals throughout the day. The honest among them are those who, getting such excellent results by methods which they know, see no reason why they should change from a certainty to what might prove a failure. True enough. There was a time when I held similar views, and when I failed to make good with wire floors. But one failure does not make me give up. As I was probably among the first to discover that it is not absolutely essential for the well-being of chickens to provide them with the means of scratching through litter to obtain their food, so I found that chickens can, and do, thrive without such exercise; hence, although the rearing of them on wire floors does very considerably reduce exercise, their digestions do not suffer, provided they are properly managed. And this I have proved to my own satisfaction.

Birds which were brooded under this most modern of methods are in as hard condition, as close feathered, and as active on range as those which were brought up in the most natural of ways—by broody hens at liberty. A big batch of them is running together as I write; and it would be impossible for the most expert of strangers to tell "t'other from which." Naturally, we on this farm know the hen-reared birds, but only because they are sex-linked pullets while the others, from the wire floors, are pure bred. So, indeed, it always will be with chickens so brooded, when they are reared under proper conditions.

Good Results Obtainable

Old hand as I am at rearing poultry, I never get better "doers" than those which pass the first few weeks of their lives on wire. It may be that, to quote from a recent remark on the subject, "we are a long way from understanding the exact feeding requirements of young chicks." It may even be that feeding in the batteries is a matter for experiment, and that "different types of food suit one battery rather than another." But to suggest that the operator should experiment with the numerous battery mashes on the market—to compare the growth and weight of the birds with the food consumption—until he finds one which suits whatever battery he happens to be working, is suggesting that which few, if any, commercial chick rearers have time to undertake. Nor is there any necessity for it; because, while experiments are undoubtedly interesting to those who have the inclination and capacity for carrying them out, if it were essential that each battery have its own special method of feeding, then, assuredly, would each maker of these appliances have his own food formula—it would be part of the outfit. However, that is not the case; and, although there are several battery mashes on the market, and different formulae have been recommended from time to time, each will probably give good results no matter what battery is being operated.

Admittedly, in the early days of battery brooding little was known of the special food requirements of chickens which were being reared under such changed conditions; but we have advanced since then. Feeding is the crux of the matter. Given the strongest chicks, they must be properly fed if success is to be attained. Their accommodation is, of course, of some importance, as, indeed, is their general management, subjects with which I have dealt in the preceding chapter; but, as far as my experience goes, they rank second to dietary.

The question of the most suitable food is a very important one, because, as battery-reared chicks get much less exercise than those which are being reared by ordinary ground conditions, and often less sunshine and air, they are more susceptible to the harmful effects of incorrect feeding. Hence, for them, the diet must be relatively low in fibre, of a highly concentrated nature, and high in both protein and energy. For this reason, price in chick mashes must always be secondary to quality and digestibility; a cheap mash of poor quality is a relatively dear food, if growth and freedom from rearing casualties are taken into consideration. Very bulky mash is not suitable for chicks in these circumstances. It is thought that the diet must vary according to the object in view, that is, according to whether the birds are being raised for laying or stock purposes, or for table. It is not so, nevertheless, in the brooding stages, that is, during the few weeks they are in the batteries. One must remember that the food is made up specially for battery use, and it is not of similar composition to that which is given under ordinary (ground) conditions. The chicks cannot obtain anything beyond the food which is given to them; and with a suitable ration growth is almost automatic.

It has been said that the tendency peculiar to birds so reared is to grow at an abnormal rate for the first three or four weeks; so that unless they are very carefully watched they develop leg trouble. However,

there will be little fear of the birds outgrowing their strength if the diet is one which requires slight alteration in easy stages. It is for this reason that I find such a one more beneficial than any which allows no change during the brooder stage, and only one change between hatching and maturity. Such a method as this latter is possible when the chickens are permitted outdoor exercise and they get grain in addition to soft food; nevertheless, battery-reared birds should have nothing but dry mash, that is, grain should not be given to them. At any rate, that is the method of feeding I adopt when rearing chicks on wire floors, and which has produced such excellent results.

Battery Rations

As food is available all day long and some of the chicks are nearly always at the troughs, it is essential, if keen appetites are to be maintained over the whole period, that their day should not exceed twelve hours. Too long a feeding day is likely to promote too rapid growth; and that is not desired. It is, however, necessary to prevent starvation by long hours of rest; hence, in winter, chickens require feeding by artificial light in the morning and also in the evening. It is generally found that the best results are obtained from an all mash diet, that is, nothing but dry mash; so grain and wet mash must be excluded, even though at least one successful rearer advocates grain in addition. The formula which I have found to produce thoroughly sturdy chickens is that which, after being evolved and tested under commercial conditions, was recommended in 1931 by the Poultry Nutrition Section of the Animal Nutrition Institute, Cambridge University. It is as follows—

DRY MASH MIXTURE No. 4
(No grain)

	1st Day to 4 Weeks	4–8 Weeks	8–11 Weeks	Growers' Mash
Maize meal	33	35	40	50
Linseed meal	—	2	2	2
Bran	19	10	5	5
Middlings	24	24	20	20
Sussex-ground oats	—	10	10	15
Dried skim milk	10	5	5	—
Meat-and-bone meal	5	5	5	2
Dried yeast	5	5	2	2
Soya bean meal	—	—	5	2
Cod-liver oil	1	1	1	—
Steamed bone flour	—	—	2	½
Limestone flour	2¼	2¼	2⅛	1
Common salt	⅛	⅝	¾	½
Iron oxide	⅛	⅛	⅛	—
(all parts by weight)				

Notes. The above is the formula for the all dry mash system. Only the best quality meals, etc., must be used, while "fine" middlings is recommended as it is a highly digestible food. And, since the cod-liver oils of commerce vary considerably in vitamin contents—the addition of cod-liver oil to the mash is the customary method of furnishing extra vitamin D, the sunlight vitamin which must be supplied to battery-brooded chicks—great care should be taken to get only medicinal quality from a reliable source. This oil, one pint of which is equal to 1 lb., is best sprayed into the mash rather than rubbed in by hand, although if only a small quantity be required it can easily be prepared as follows: About 20 lb. of bran will absorb 1 pint, which quantity of cod-liver oil is sufficient for 100 lb. of dry mash. Scoop a hole in the centre of the bran, pour in the oil, gradually cover it with bran, and work it in by hand. It should be ready in ten minutes, when the other ingredients of the mash can be added and the whole blended. The oil must not be heated in any way. The man in charge of the chicks should see that the dry mash in the troughs is always fresh at least once a day, and that the food and water vessels are kept scrupulously clean.

The Dry Mash System

It will be readily understood that, as chickens which are being reared in battery brooders and brought up on the all dry mash system of feeding do not get grain—except as mentioned later—or wet mash, there cannot be any set feeding times. That is, for them, there are no regular hours for breakfast, dinner, tea, and supper, or breakfast, lunch, afternoon tea, and dinner, as you will. Their food is before them practically as long as they can see to eat, and they can, as they do, take it whenever they like. There can be little doubt they arrange their own meal times, because, even under the most natural of methods, chickens eat only when their crops are empty. Nevertheless, although there is no set feeding time-table, it does not mean that the attendant has nothing to do beyond visiting the battery once daily to empty, clean, and refill the water vessel, see to the mash trough, and clear away the droppings.

The chickens' appetites must be kept keen enough to ensure good feeding and satisfactory growth. In a measure this is assured by adopting mash formula No. 4 mentioned above, because some ingredients of the mash are altered in their percentages and added to every four weeks, while emptying their troughs and refilling them with mash daily is also beneficial. But chickens appear quickly to detect any staleness about dry mash; and, once this happens, it almost invariably puts them off their food. Hence it is most advisable to have a glance at them every hour or two hours during the day, if merely to alter the surface

of the mash and thus keep it fresh. Moreover, I find that these visits throughout the early stages enable the attendant to see that, should some of the smallest chicks have worked their way between the bars or through the holes of the grids with which their food and water troughs are protected, they are rescued before much damage is done.

It may be thought that, because the all dry mash system does make for simplicity of feeding, less skill is required to manage the birds. This is not so in practice; and while it is possible by proper attention to rear them satisfactorily to the off-brooder-heat stage on wire floors, it entails constant supervision. Cleanliness is most essential. Any sickly chick must be removed immediately; hence the birds must be thoroughly inspected each morning. They should be got accustomed to ordinary day temperature as soon as possible, but without any risk of their getting chilled. They should be off room heat by the sixth week; but unless the weather is favourable they should not be turned out of doors at such an age. Some rearers use the batteries for the first three weeks only, at which age they transfer the chicks to the ordinary hovers in brooder houses with grass runs. But while ground rearing does unquestionably make for stamina and vitality, granted that only strong chicks from hardy breeding stock are put into the batteries, it must not be supposed that six weeks on wire floors will so weaken the birds that they will be useless for stock or laying.

There are, of course, difficulties connected with battery brooding; but they are not insurmountable, and, with proper management, excellent results can be obtained. I am so sure that chickens which are being reared in these unnatural conditions should have the maximum of sunlight that I am opposed to closed-in and darkened cages for day use. All troughs used should permit the light entering practically every corner of the cage. I admit to a preference for batteries which are fitted with separate sleeping compartments, even though they do entail rather more attention at first, and do not permit of as many chicks being kept in the same room space; but they enable the birds more quickly to become accustomed to the outside air, as they consist of warm and cool zones.

I have said that my chickens while being brooded on wire floors do not get grain. One of the largest commercial poultry-farmers in the south of England, however, gives certain of his birds grain once *per diem* while they are in the battery. This authority agrees that, when a rapid and continuous rate of growth is essential—as in the case of chicks destined for the table—the all dry mash diet is advisable; but he finds that grain in addition to dry mash is advantageous for those being raised as future laying stock, as it seems to produce stronger, better developed and more tightly feathered birds, and does much to prevent leg weakness. For such chickens (laying stock) he incorporates flint grit in the mash, and provides them with fresh green food after the second week. This is of the kale variety, the green food being very finely chopped and put into a special trough. The grain, one meal *per diem* of cut wheat, is sprinkled on top of the dry mash. The dry mash formula for this particular method of feeding is given herewith.

DRY MASH MIXTURE No. 5

(To be used in conjunction with fresh green food and cut wheat.)

Superfine sharps	40	parts by	weight
Home-milled bran	20	,,	,,
Sussex-ground oats	20	,,	,,
Maize meal	10	,,	,,
Marrow bone-meal	5	,,	,,
Buttermilk	5	,,	,,
Insoluble flint grit	5	,,	,,
*Mineral mixture	2½	,,	,,
Cod-liver oil	1	part	,,

*Mineral mixture: parts by weight: carbonate of lime 1, sterilized steamed bone flour 1, and common salt ½.

Note. This dry mash is supplied to the chickens from the first day of feeding, the grain being given in the evening. Water is provided from the beginning, and green food from the end of the second week.

In the case of chicks which are being ground-reared on the sun balcony system, as mentioned in Chapter VI, the ration and the method of feeding may be similar to that suggested in connexion with Time-table No. 2; and, as the birds are being kept strictly intensively, special attention must be paid to green food and direct sunlight, or their equivalents. It is generally difficult to secure fresh young greens in winter; hence resort must be had to the best quality leafy alfalfa or red clover hay. This can be cut into ¼ in. lengths by a clover cutter and put into wire-netting racks; and in this way it will give the chickens something to pick at and utilize much of their time, which is so desirable for those reared indoors. Cod-liver oil will, of course, have to be included in the diet, since one cannot rely on the chicks getting sunshine daily throughout winter. One very important matter in connexion with this system of rearing is to allow the chicks to perch at the earliest possible moment on such a platform as I have already described; and they should be encouraged to do so during the fifth week, the birds being driven on to it if necessary.

Changing the Quarters

When chickens are ready to be transferred from brooder to range, to be accommodated in field house, ark, or colony house—the age at which the change

may safely be made will depend largely upon prevailing weather conditions—it is advisable, whenever possible, to let them have the use of entirely new land, that is, land which has not been stocked with poultry. Unfortunately, this cannot always be managed; and yet it is of the utmost importance that their run be clean and uncontaminated. On many poultry farms, as distinct from farms on which large numbers of poultry are kept, space is at a premium, and, too often, every available acre has to be occupied right through the year.

It would give very much better results, however, if a section of the farm were set aside solely for the chickens, so that it could be vacated during a certain period, and during that time scratched over or harrowed and limed, and, possibly, parts of it dug and sown with grass seed. Even though chicks which are brooded by hens are often allowed to continue on the same ground they occupied from the start—that portion having been fenced off for the sitting hens, and successive broods are not desirable—it will be found much more beneficial to allocate to these small broods another patch on which to "grow" them. Of course, there must be other quarters for artificially-hatched birds, because the land attached to the brooder house or cabin, or used by chicks which are accommodated in movable rearers on the fold system from the first, will be wanted for the broods which follow.

It is a great mistake to attempt rearing them on stale land or land on which there have recently been sick birds; and it is especially essential to avoid grassland which has been stocked with turkeys suffering from blackhead, pheasants with gapes or coccidiosis, or fowls with pullorum disease. If the growers have to be kept in an enclosed area which has been used by thoroughly sound adult stock, it is always advisable to vacate the place for at least a couple of months previously, so that it can be treated and prepared for the young birds. A small plot of grassland which has been regularly rolled and cut, and frequently flicked over with a besom (a broom made with twigs), may need only a vigorous scratch with an iron rake; but it should be left unoccupied for a month or so to freshen. In any case, however, let the chickens have a clean run when they are off brooder heat, provided the intention is to rear them for stock and laying, and not merely for table purposes. But even those which are destined to end their days while still in early youth—the cockerels which must go to market—will benefit by a fresh run, unless they have to spend their short lives in batteries. Clean land is the first move in the development of chickens which no longer require artificial heat.

This is so, although no more space than the usual back garden can be given over to them. It applies likewise to birds which are being brought up entirely on the intensive system without wire floors; and, although their "land" is litter, a complete change of it—as, for instance, from sawdust or chopped straw

FIG. 133. CHICKEN ARKS

Portable chicken houses, such as those shown above, can be utilized for growers, until the cockerels are ready to be transferred to the fattening pens or set aside for stock, and the pullets are sufficiently advanced for drafting into the laying quarters

to granulated peat moss or freshly dug earth—will have a most beneficial effect on the growth of chickens. The land must be fresh to begin with; and it must be kept fresh. The one is as important as the other. This means that it must not be overstocked.

Avoid Overstocking the Run

Overstocking is tantamount to overcrowding, although overcrowding can, and sometimes does, occur where free range is available. It is, in fact, a somewhat common fault almost from the day-old stage to the time of furnishing, when the pullet is of an age to commence laying; and it is this part of rearing which demands so much attention on the part of the attendant. But chickens cannot grow in a steady manner and feather properly unless they have plenty of room; hence it will be seen how very important it is to avoid overcrowding. If it were not for the extra labour involved by very small units when hundreds of chickens have to be reared, then the folding system would appeal to me; but when, to cope with large numbers many of these appliances have to be employed, so much time is taken up by the daily move of each one to a fresh spot, in the feeding and watering of the birds, and in the spreading of the manure, that I am not surprised that many commercial chicken men fight shy of this system, however much it may appeal to the pedigree breeder and the farmer.

If, therefore, chickens cannot be given practically free range during their growing period, let them be confined to grass runs, orchard land, or garden; but allow them to have the same amount of land from the commencement as they require in their adult stage. This may appear to be setting aside far too much space for them; but it will be to their advantage. There are authorities who insist that not more than 200 growers should be kept to the acre and that, even then, the land should be used only on alternate years. However, although no definite rule can be laid down, so much having to depend on the aspect of the range and the nature of the soil, it is quite possible to rear as many as 400 chickens to the acre. I have succeeded with such numbers in lots of fifty to a pen, in grass orchards and on grassland which had bush in places and where controlled clumps of nettles and thistles were allowed to grow. For young stock I rather prefer land such as the latter to an open stretch of meadow devoid of shade, because, while the herbage may be somewhat poor, the shade is decidedly beneficial in sunshine and in rain.

There can be no question about a clean grass range being the ideal method for rearing chickens; and, of course, the more space they can be allowed, the better for their well-being. The birds must have healthy environment in their developing stage; it is necessary for size and stamina. Hence, keep even as few as 100 to the acre, if more than that number would cause fouling of the land. Particularly should pullets be grown on range to enable them to store up a reserve of vitality against the strenuous period of prolific production during autumn and winter. We want them to live long and lay well; so they must be developed under healthy conditions.

It is not impossible to rear chickens entirely on the intensive system; and some poultrymen manage to do so successfully. But it adds considerably to one's labour; and I cannot imagine it would be of any service when the chicken season has to extend through most months of the year. Extensive rearing is well-nigh imperative for birds which are being raised for stock, if merely because it provides them with plenty of space in which to exercise, and thereby develop their muscles. The chickens also have the opportunity of getting insect life and all the fresh green food and minerals they require. Admittedly, there are excellent substitutes for these items of the diet, such as meat and fish meals, milk, alfalfa and clover meals, and mineral mixtures; and yet it is my experience that chickens never develop so well for stock as when they are on range. It does much to prevent fouling of the land, while the birds are altogether more contented; they enjoy their food, and since they can get out of each other's way, there is little, if any, of that bullying which is so detrimental to growth.

Housing the Growers

Even when the ideal rearing ground has been provided for them, however, the actual housing of the growing stock is a matter of some importance. And unless the move from the brooder house to outside conditions is undertaken with considerable care, there is the likelihood of the chickens experiencing a check from which they may never completely recover. Just when the more natural conditions should give them a fresh interest in life, they get a definite set-back.

While they are in the brooder house, it almost invariably happens that they pass their nights on the ground; and so accustomed do they become to this form of sleeping that it requires no end of patience to teach them to perch. But perch they must—as soon as they are off brooder heat; otherwise, they will crowd into corners, which is a certain way of lowering their vitality and the general power of resistance to disease. It has been said that, as soon as chickens take to the roost, there is very little trouble with them; but it is getting them to roost, to sleep above the ground, and so to breathe fresh air, that is really one of the most troublesome parts of chick rearing for the novice. For this reason, there is much to be said in favour of brooding them on wire floors; because,

while the birds cannot grip the wire as they grip a perch, it gets them into the way of spreading while sleeping, and used to air circulating around them, instead of packing closely together and becoming overheated.

That is one little drawback of the brooder house —it is rather inclined to encourage crowding, no matter how much floor space is allowed. It is in the brooder house, though, where the training must begin. Those who have to rear chickens intensively, that is, to confine them indoors throughout winter—with the addition of sun balconies for use on fine days—know the great benefit of providing the birds with plenty of fresh air, and with a roosting platform such as I have described. This platform might well be one of the fitments of any brooder house used for ground rearing when the youngsters cannot be allowed much outdoor exercise during their brooding stage. Fresh air, of course, they must always have, and particularly when they are being hardened off prior to the transfer. So see that they get a plentiful supply of it at nights in the brooder house for a few days before they are moved to fresh quarters. And do not forget to spread clean straw or sacking over the slats in the arks for the first few nights if the weather be chilly.

No matter whether field house, colony house or cabin is employed to accommodate them on the range, it should be fitted with perching facilities; and, because the floor of the ark is slatted and prevents sleeping on the ground, every chicken house should have such a floor. It does not relieve one completely of anxiety; but it does force the birds to roost above the ground. If chickens are given the opportunity of choosing between the ground and the perch, the majority of them will not take naturally to the latter at the beginning but will "pack like sardines" into any corner. It cannot be on account of the perches being too high for them to reach, or placed in such a position that they cannot get up and down with ease, because, before I adopted the ark system of housing the birds, I used to fit the roosts only about six inches from the floor. But having to spend hours and exercise a considerable amount of patience putting the youngsters on the perches of an evening forced me to adopt the old Sussex method of chicken arks.

Early Perching Advisable

There is no doubt that single perches do prevent bunching; but when hundreds of birds are being dealt with at once, the labour involved in getting them accustomed to roosting is really too trying in what is undoubtedly the busiest part of the year. Chicken men never expect to get an eight-hour working day at the height of the season; it is nearer sixteen, and during seven full days a week. And if it were not for the two or three hours' rest we can generally manage to get around noon, I question if many of us could carry on. So, to cut out the perch training, I long since adopted the slatted floor; and this I find preferable to a wire-netting floor or to one of perches about an inch over wire-netting.

I have tried all these methods, but I find that the slats are best, and even for the chickens which have been brooded on wire. Neither wire-netting nor slat, however, prevents crowding at the commencement; and that is the point which must be watched. Even with perches over wire-netting, the chickens will crowd, because while some will sleep on the perches others will get between them, which is decidedly worse than slats only. So, when the birds are on the slatted floor for the first week or so, although that floor may be covered with straw or sacking to begin with, it is imperative, as soon as they are in the house for the night and the door is closed, to open the top flap and spread them around.

The strangeness of the new abode probably occasions a certain amount of nervousness among them, although, as I say, they have become so accustomed to huddling together in the brooder that they follow that method until they are broken of it. They certainly do not so sleep to keep themselves warm, because late-hatched chickens which I have put out to range in summer, with ark accommodation, have crowded into corners. Hence, each house should be visited just before dusk, so that the youngsters shall be spread over the floor. To do this is very much less irksome than picking chickens from the ground and putting them singly on the perches—some have to be put up more than once the same night at the beginning. This spreading out should be undertaken each evening until they learn not to crowd on each other in the corners.

Another little matter which requires attention is to run some small-mesh wire-netting temporarily around the bottom of the ark to prevent chickens getting under the floor. It should not be necessary to do this for more than the first few days. Then, too, it is advisable to see that all the youngsters do retire to roost. It is scarcely possible to count heads when they have settled down on the slats, or to check off the numbers as they are being spread over the floor; but it is as well to take a look round to make certain that none has gone to bed in bush or clump. Sleeping out will not be likely to harm sturdy growers in spring or summer; but such birds fall an easy prey to rats, foxes, and other vermin. Most chickens like to wander about during the hour before sundown; so, I endeavour to give them their last meal of the day well ahead of that hour. They will then retire while there

is sufficient light to attend to their necessary evening tasks.

Do not let chickens sleep in a bunch, so to speak, if it can possibly be avoided, because such overcrowding is about the worst thing that can occur to them. Although one great benefit of the open floor is that it allows air to pass under and around them, little fresh air can get to chickens which are huddled together in a corner. Another important matter is to see that all the birds do leave the ark of a morning, because I have found a half-grown pullet with a foot caught between the slats, which was a very rare occurrence. These are all small matters; but carrying them out will make all the difference between success and failure when the birds are moved on to range.

quarters, no matter how much they may mix during the day. On this plan 200 is the maximum per acre, so that fifty will be the limit for each house.

All the chicken houses are portable and they are moved once or twice a month, when it becomes necessary to clear the manure away. Some of the arks are fitted with droppings' trays to facilitate the clearance, as the manure keeps dry on the wood and can very easily be taken off with broom and shovel. Others are without trays; but, always, the accumulation is taken right off the land, and not merely spread around or left for the chickens to scratch about on.

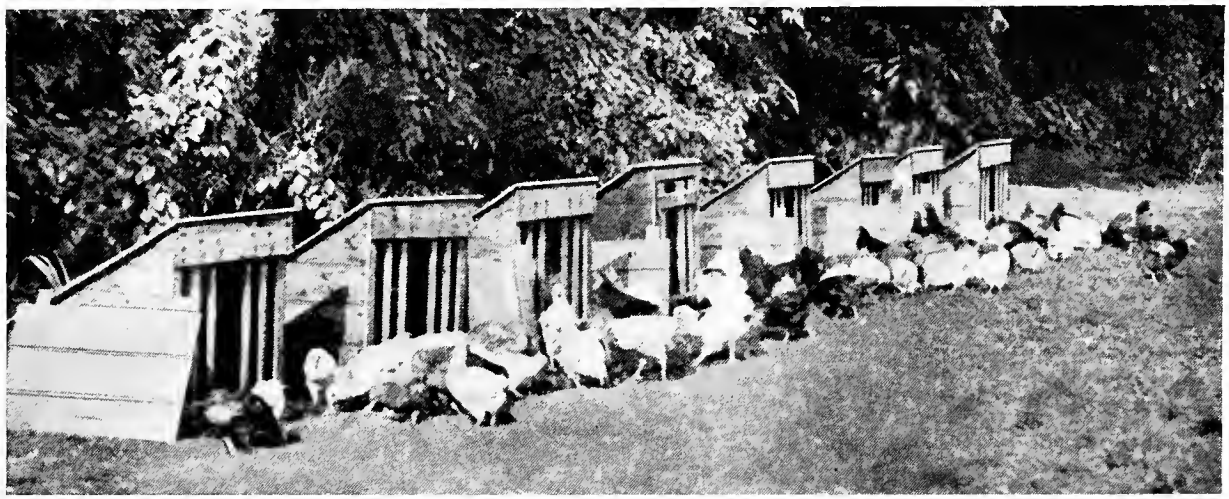


FIG. 134. THE OLD SYSTEM OF REARING

Some poultry-keepers still house their growers in the coops in which the birds are reared; but it is preferable to provide them with a Sussex ark or similar appliance as their sleeping quarters

Locating the Houses

Then there is the question of locating the houses. When the runs are fenced off, only one ark should be placed in each section, and as near the middle of it as can be arranged. This may be rather more inconvenient for the attendant than having them against the fence; but it provides the chickens with a certain amount of shade at all times of the day. When the range is open and it consists of an orchard or paddock, the houses can be moved around it; but I prefer to set out about four to the acre, as wide apart as possible, so that each colony of chickens can keep to its own quarters. In either case, however, when they are first put out we confine them to the immediate neighbourhood of the house for two or three days by a temporary wire-netting fence, so that when they are given their freedom each lot returns to its own sleeping

The folding system, necessitating a daily move, would obviate this task; but I prefer the once or twice monthly move of the ark or field house, even though the ground immediately surrounding it may get slightly worn. These portable houses are shifted when they are empty, and thus the birds are not in any way disturbed.

Feeding the Growers

So much, then, for the accommodation of the growers. Give them the maximum of space that is available, keep their house and run clean, and pay as much attention to them as would be bestowed on the very best laying stock. Rearing may be said to be all outgoing; but it will be capital well invested if the chicken man does his part of the work. The birds must be fed, of course. Two very important little points in this direction that should be noted are that they be fed early in the day, and that they go to roost in the evening with their crops full of sound grain. Until they have become thoroughly settled down to

their new quarters, I like to continue with the feeding formula to which they have been accustomed while being brooded, as far as it is possible to do so. That is, for instance, if they have been brought along on the all dry mash system, it is continued, with the alterations set out in the food tables already mentioned in this chapter, and up to the ages stated.

Towards the end of the period, nevertheless, grain is added. At first it is given as a late afternoon meal and then in the morning also, so that eventually the birds get two meals of corn *per diem*, with dry mash in addition. Some rearers leave the dry mash hoppers or troughs open all day; but, while this may be desirable when the chickens are being brought up on enclosed runs, it is more beneficial to confine the dry mash to one meal only when they are ranging freely. At any rate, so widely do the birds wander that, generally speaking, they do not require free access to dry mash. Hence, to leave the food exposed is unnecessary; moreover, it is very apt to attract starlings and other birds, which at the best of times are a menace to the poultry feeder and prevent economy being exercised in feeding. It may be, also, that with food before them all day long, some of the chickens would be encouraged to spend too much time in the vicinity of the troughs and thus fail to benefit by exercise. There is no doubt that foraging for natural food makes for hardiness, while I am sure that the exercise they get in this way enables them to enjoy to the full the food which is put before them at regular times.

As I have said, chickens which are brooded on wire floors are dry mash fed during the whole of the time they are in the brooder; but, once they are at range, or at any rate as soon as they have settled down to the change of quarters, my method of feeding them changes also. They are gradually brought on to grain and to set meal times. As a matter of fact, little actual dry mash is given to them after ten to twelve weeks—and sometimes it is discontinued before then, according to the age at which the chickens are removed from the brooders—because I am very strongly opposed to feeding birds which are not of the least bit of good to me and which, by their germ-carrying capacities, may even bring disease among the chickens. It may look nice to some folk to see starlings, sparrows and other birds of the air feeding along with the chickens; but, not having an eye for that form of beauty—and, moreover, having to purchase the grain, meals, etc., my fowls eat—I do not indulge in it.

When dry mash is given to chickens in the brooder house, it is under control; and except for an occasional finch or other small bird getting in—which I do not encourage—the whole of the food is eaten by those for whom it is intended. But, since all my ranging youngsters which have arks, colony or field houses as their sleeping quarters are fed in the open, it is another matter—if dry mash were kept constantly in trough or hopper much of it would be taken by wild birds, and probably rats, while some of it would be fouled. Admittedly, there are arks and slatted floor houses which are fitted with dry mash hoppers, to which the birds have access from inside, and others have such troughs on the outside; but in neither case do I find that the arrangement keeps wild birds away. Also, food so placed has a great tendency to induce chickens to hang about the house instead of using their range,

FIG. 135. GRAIN FOR GROWERS ON FREE RANGE
Although the grain had been put down for the growers, a couple of ducklings and three young turkeys managed to participate in the meal

and dry mash in the open is apt to be scattered by the wind. For these reasons, therefore, what dry mash my growers get is given to them as a specified meal rather than being left before them all day; and it is not down for more than half an hour. But gradually the dry is changed to moist; that is, the mash is worked up in buckets or the mash tub, with a small quantity of water, just enough to damp the ingredients without causing them to bind together like dough. It is put into long wooden troughs at the set meal times, and almost without exception all of it is cleared.

Early and Late Meals

There is one point worth noting—allow the birds ample trough room. Most of my mash troughs are 6 ft. long, some even longer. My object is to permit of every bird getting a chance to feed, so that there shall be no fighting for a front place. It is a little matter, perhaps, but it makes a lot of difference and keeps the birds contented. Four set meals *per diem* will be ample for the chickens which are on range. Breakfast, of moist mash, should be given at 7 o'clock, and a second meal of it put down between 1 p.m. and

1.30 p.m.; at 9.30 a.m. they should get grain, and this should also be provided an hour or so before sundown—always grain as the last meal of the day for growers. These meals should be given around the same times each day, although the actual hours will vary according to the season; but regularity of feeding ensures steady growth.

Those who rear autumn and winter chickens feed their birds early and late by artificial light; so that any which are being field-reared—most of them are brought along by the intensive system—should be provided with plenty of shed room. At about four months of age the meals may safely be reduced to three *per diem*, the first and last being of grain and the midday one of moist mash. However, this is a matter which the attendant must watch. Perhaps before that age the birds may show a disinclination for their early afternoon mash—they seldom refuse the first two meals of the day—in which case it would be discontinued, or the first meal of grain reduced. But if there is a distinct refusal to eat it—and, of course, the mash is properly mixed—then by all means omit the 1 p.m. mash and let the first grain meal be given at midday, or even a little later. On the other hand, if they do not eat their breakfast mash with a relish then try using more water, that is, prepare it in a damper state, or give them corn. Generally, though, at four months, three good meals will be enough for them, and particularly if they have a wide range.

FIG. 136. GROWERS AT THE MASH TROUGH

No matter how many mash troughs are provided, young fowls almost invariably crowd around the first one filled with the food. Two dozen of these Rhode Island Reds, White Wyandottes and Buff Rocks in one run had three troughs, but two-thirds of them are attempting to feed from one

It will be understood that these meals of moist mash are not supplementary to but in lieu of dry mash. That is, birds which have them must not also get dry mash. Moreover, both the meals of moist mash—when the growers are being allowed four meals *per diem*—should be on the short rather than the generous side, the grain rations, however, always being full ones. Growing pullets require a comparatively large amount of food; but, until they have reddened up for laying and are practically on the verge of production, it is a mistake to attempt overfeeding them with moist mash. There must be no starving, of course; but they should get more grain than moist mash all through their growing stage. If they will take dry mash readily, let them have it, with moist mash at special periods only.

When chickens which have been fed on the all dry mash system during their brooder stage are first put on to grain they may not take kindly to it; hence I give it to them from troughs. This is necessary not only to accustom them to the different form of food—which some chickens refuse to eat at first—but it enables me, by the end of a week, to get a good idea of the quantity they will require. After that time it is scattered for them, generally in a long thin line, so that all of the birds can get a chance to eat. Scattering grain broadcast, like the old-fashioned way of sowing corn, and particularly when chick mixtures containing several kinds of seed are used, is very apt to cause some of it to get overlooked, and this generally results in a crop of weeds the following springtime. There are, of course, many systems of feeding chickens in their growing stage; but which is the best is beyond me to say. However, I cannot find any fault with my own; and, since they have been adopted by thousands of other poultry-keepers, they evidently satisfy them as they certainly satisfy me.

Attending to the Pullets

Pullets are being dealt with, because the vast majority of the cockerels which have been allowed to live are reared for market. I rarely find it necessary to kill the male birds as soon as I can distinguish them from the pullets because, when rearing general-purpose breeds and sex-linked crosses, there is almost invariably a good sale for them—at paying prices. I never reckon to dispose of "killers" at a loss. No doubt it would be otherwise if I were hatching any great quantity of light-breed stock such as Leghorns. It was so, in fact, when I had a season with that breed, because, as the cockerels were of a special

laying strain, the surplus birds did not make a good show on the table and they just about cleared the cost of their food.

When difficulty is experienced in disposing of surplus cockerels of heavy breeds, I generally find it is because the odd birds have not been brought along in a proper manner for market. It is useless allowing them to run at large until they are four or five months old, since, while this is essential for those which are being reared for future stock, or for exhibition at chicken shows, it generally makes them too old-looking and "cocky" for table. If, however, when they are separated from the pullets they are put into a small run by themselves and given wet mash and boiled grain, they should be sufficiently plump and tender at about ten weeks old to make suitable table chickens. There should be a good outlet for such birds, if they can be guaranteed as being fed up to a certain weight; and they are likely to prove remunerative to the producer who can get into touch with local butchers, poulterers, fishmongers, and hotel keepers, private consumers, and the like. It is not a matter of sending them to the ordinary market but of disposing of them in small numbers as they are ready. Dealing in these surplus cockerels is altogether different from making a speciality of the table poultry trade. Local shopkeepers can frequently find customers for them; and since the birds are often accepted alive, it saves the producer the trouble of killing, plucking, and trussing them.

However, to return to the pullets which are being brought along for egg production. A good general mash for growers, to be used in a damp rather than a dry state, is as follows—

GROWERS' MASH

Weatings (middlings, etc.)	4 parts	by strike	measure
Bran (home milled)	3 ,,	,,	,,
Maize meal	1 part	,,	,,
Sussex-ground oats	1 ,,	,,	,,
Barley meal	1 ,,	,,	,,
Meat-and-bone meal	¼ ,,	,,	,,

FIG. 137. NIGHT ARKS FOR COCKERELS

The cockerels, White Leghorns, are well accommodated; and although the birds enjoy a wide range, there is little fear of their being overcrowded at night when so housed

In conjunction with this mash the grain ration should consist of a mixture of four parts of wheat, and two parts each of plump clipped oats and finely kibbled maize; or sound tailings of English wheat will answer, with about a fourth the quantity of kibbled maize, all parts in this case being by strike measure. This diet should prove beneficial for pullets which are being grown in confined runs. Fish meal or any other kind of animal food is necessary only for birds in those circumstances, but it should not be added to the rations of those which have free range of meadow land. Such food, judiciously given, will cause pullets to commence laying at a proper age; but if overdone, it checks growth and, in the vast majority of cases, it results in very small eggs throughout the whole of the pullet's first laying season. Early laying may be desirable; and yet I see no sense in giving pullets highly concentrated foods which force them to begin while they are still in their growing stage. This undue forcing of pullets cannot be too strongly condemned. In the endeavour to form

record-breaking laying strains, the matter can be very easily overdone for practical purposes.

Avoid Forcing Foods

It is well known that some varieties of a breed are better layers than others, while some classes of fowl begin to lay earlier than others, because they furnish up in less time. Practical poultry-keepers know that to get winter eggs the pullets must be hatched reasonably early, and brought to the laying stage some time in autumn or before the cold season sets in. It is not possible to get the birds to commence just when one wishes; hence it is folly to attempt forcing them by giving them a large proportion of meat meal, fish meal, or other animal matter. Such forcing is incompatible with the normal development and maturing of the bodily functions; and the pullet so reared remains always with a weak constitution, and she is never fit to reproduce robust offspring. The best way to keep the pullets growing is to separate them from the cockerels as soon as they can be distinguished, and to give them practically unlimited range. They must remain in the open air all day long and also get the whole of their food outside, except during very wet weather. However, should it be impossible to provide them with their freedom, then let them be kept in such a way that they will have to take a good amount of exercise. It is much more difficult to manage growing pullets in small runs than when they are allowed a wide range; but the difficulty is not insurmountable.

The growers' mash detailed above will be found beneficial for such birds; but biscuit meal can take the place of Sussex-ground oats, while, if fresh green vegetables are not available, the bran could be reduced to two parts, and one part of alfalfa (lucerne) or clover meal added. The pullets will require three meals *per diem* until they start laying. Those of the light and non-sitting breeds should have about six months in which to grow, and I never object to let them go the whole of that time, provided they progress in a satisfactory manner, while general-purpose pullets should be seven months old before they commence. High feeding results in large and heavy eggs; but the pullets must be well developed bodily before they are put on an egg-producing diet. I have no objection to dry mash, particularly for pullets which are being brought along in small runs; but, for reasons which have already been stated, it is not advisable for them to have the food before them all day. If this be allowed after the birds have passed out of the brooders and before they are being specially fed for laying, it encourages them to become lazy; and they then do not take the exercise which is so essential for their growth, and which does so much to enable them to enjoy their meals and properly to assimilate their food. Sound food given at regular times, and at intervals sufficient to permit of the internal organs filling and emptying between one meal and another, keeps the birds active and muscularly fit; and it is the surest way of ensuring robust stock.

Whenever it is possible to do so, the pullets should be reared on land where there is plenty of shade, which is an asset if not a necessity, and accommodated in small field houses or Sussex arks—in which they sleep only—the former being fitted with several perches or a slatted floor. If general-purpose breeds are being reared they should have dry mash put down for half an hour or so at midday, with moist mash for breakfast, mixed grain (wheat, kibbled maize, and clipped oats) at 9 a.m., and also as the last meal of the day. The times, of course, will vary according to the season; but it is always advisable to leave as long an interval as possible between the meals, to ensure a keen though not a ravenous appetite. Although it may not be thought so, it is quite possible to put down more food than is good for growers, to the extent that they will pick and choose and not clear their meals. It is by no means rare for novices to make such a mistake. I have seen fowls at free range and on extensive grass runs leave half of what should have been a normal allowance of wheat, not because of there being anything wrong with the grain, but simply because they were having free access to dry mash. I would rather keep growers short than feed them in such a way that they refused their grain. However, if the pullets are fed as I suggest they should take their food in sufficient quantity to ensure steady growth, while the growers' mash should prevent the bulk of them coming into lay at too youthful an age.

When to Change the Diet

These are points which require watching—feed with the eye as well as the hand. If only an odd pullet or two makes a start—and, almost invariably, there are some which commence ahead of the others—continue with the present method of feeding; but if many begin, then gradually change over to the layers' mash. As the birds flush up for laying—which they do some weeks before they "come into egg"—their food should be increased, if possible, and more maize might be given to them. They will then be getting only three meals *per diem*. When the layers' mash is started let it contain not more than about 3 per cent of fish meal, and gradually work up to the requisite quantity. When once the bulk of the pullets have started to lay, even though it be ahead of the time they normally should do so, it is a great mistake to attempt to check them. The aim should be to encourage them to continue production. Putting

them off generally sends them into a moult; and at any rate it will be very difficult indeed to get them into lay again. Much better change them over gradually to a layers' mash, and such a one as follows—

LAYERS' MASH FOR PULLETS

Weatings (middlings, etc.)	6½	parts by weight
Bran (home milled)	3	,, ,,
Maize meal	3	,, ,,
Sussex-ground oats	2	,, ,,
White fish meal	1	part ,,
Meat-and-bone meal	½	,, ,,

sufficient stock for replacements and extension, there must be a much more prolonged hatching season. Novices are apt to think that pullets which are hatched before February or after April are practically useless for profitable egg production; but, while it is true that the earliest birds may go into moult in autumn, by careful management it is possible to get a good winter average from them. On the other hand, by employing night feeding, late-hatched pullets—those which are hatched in June, for instance—can be brought along in time to catch part of the winter

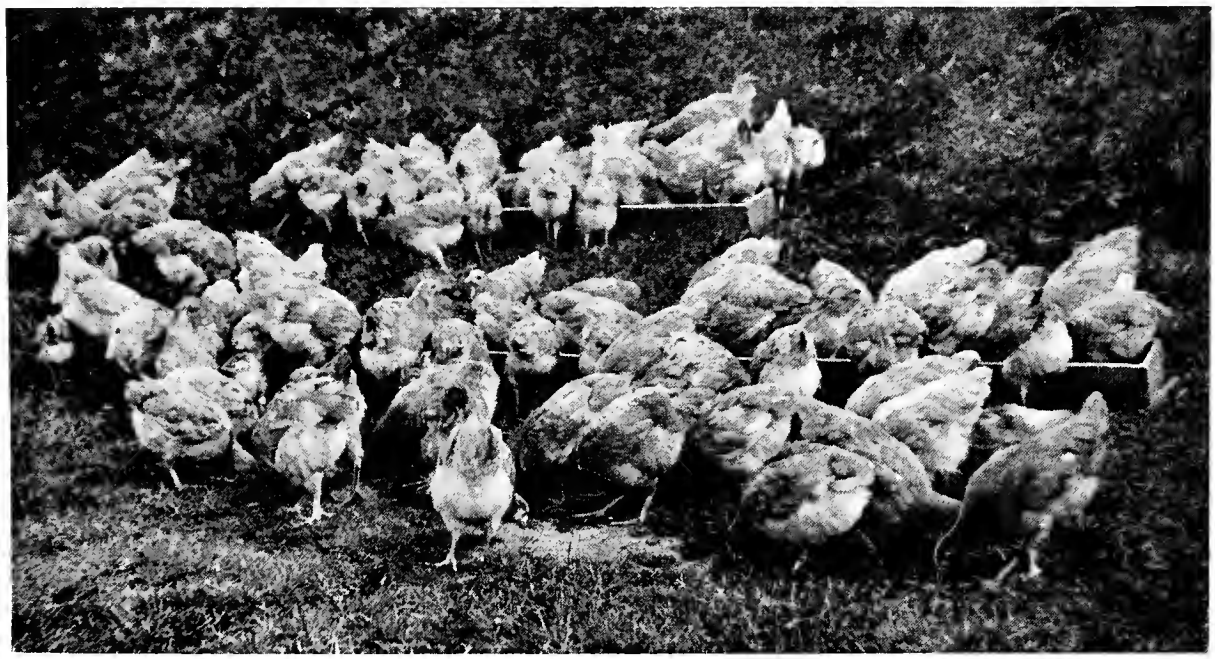


FIG. 138. "HEADS DOWN"

Except for two pullets which are about to "have words," this flock of growers—Buff Rocks—is busily engaged at the mash troughs. As will be seen, some of them are actually in the troughs, a failing with chickens

This should be used as dry mash, and in conjunction with mixed grain consisting of three parts by strike measure of wheat, two of clipped oats, and one of kibbled maize; or four parts of wheat and one of kibbled maize.

The average poultry-keeper will probably hatch his main crop of pullets in March and April, his general-purpose birds in the former month and non-sitters in the latter; and this is particularly applicable to the beginner who has only a small place which can be set aside for the youngsters. Certainly, chickens which are brought out in those months have the best time of the year in which to grow, since the hours of daylight are increasing and improved weather conditions are likely to prevail. On the commercial poultry farm, however, it is seldom possible to hatch in those few weeks all the pullets which are required. To get trade. When early and late hatchings have to be undertaken, the earliest chickens are generally bred from the heavy (general-purpose) kinds and the latest from the light (non-sitting) breeds.

It is as well to remember that line-bred pullets are worth hatching at almost any time of the year; and long before the vogue of the intensive house, and feeding by artificial light, I succeeded in getting June-hatched pedigree-bred White Wyandottes into lay before Christmas. Hence, with the splendid facilities which now exist in vastly improved methods of housing, feeding and breeding, it is not unreasonable to expect a profitable return from pullets which are hatched in June, and especially those of the light breeds. Admittedly, some out-of-season birds may not commence their laying career until eggs are cheap; but they come in decidedly handy for the summer

trade, when the hens and older pullets may be tailing off. In commercial egg-farming there must be a level rate of production at all seasons. Hence, while the main crop of pullets may be hatched during March and April, it is imperative to extend in both directions, because it is seldom that one can produce in those two months all the pullets which are required. When one is poultry-farming on commercial lines there must be both early and late hatching. One has to avoid a shortage of pullets.

The Earliest Hatched Pullets

In the way of general management it will have to vary according to the period of hatching. By this I mean that pullets which are hatched in winter cannot be treated in the same way as those which are out during spring. As I have said elsewhere, winter pullets do not develop at the same rate as the later hatched (spring) chickens. No doubt it might be possible with early and late feeding by artificial light to bring them on; but I have never yet found it advisable to go to that expense, if the birds are required merely for the production of market eggs. Such pullets, at best, would come into lay at the flush season of spring, when birds of the previous spring hatching, and even older hens, would be producing freely; and the markets would be glutted with eggs. As it is, we have enough to contend with in late winter when chilled eggs are imported from Australia and South Africa.

It would be most unwise, therefore, to flood our own markets in spring and thus force prices down. If the earliest hatched birds commence to lay in June it will be soon enough, while if they can be grown on for another month they should have developed to such an extent as to be producing full standard-weight eggs shortly after they begin. On no account, however, should they be checked when once a start has been made. In April and May their feeding might well be slightly altered, the wet mash being gradually discontinued, and little, if any, animal matter (meat-and-bone meal) being given to them. Their evening grain also could be confined to clipped oats, with an occasional change to wheat. This diet will encourage growth.

Some time in June or July, according to the progress they have made, they might be moved from the growers' range and put into one of the layers' pens—by themselves, of course, and not mixed with other stock—when they may safely have free access to a correctly balanced layers' mash, dry, this food being put inside their house; and the mixed grain, including kibbled maize, must be given to them as their last meal of the day. In September, wet mash should be started again, and put down for them at midday. This wet mash is a most important item in their diet, as it helps to rebuild the system and prevents the pullets losing weight and "going light." Most of them will have been laying for some weeks; and the object, as can be imagined, is to keep them laying heavily from the time they commence.

No doubt the best period for high prices is from August to December; hence the importance of encouraging production to the full during that time. The wet mash will also prove beneficial in assisting them through the moult, although careful management does prevent any severe change of feather. It is as winter approaches that these earliest hatched pullets are apt to drop into a neck moult, and sometimes the moult may be as prolonged as that indulged in by the adult stock, which means a considerable loss. Such a heavy moult among pullets, however, is generally due to allowing them to get run down owing to wrong feeding.

This is where the wet mash is so very beneficial. It is a set meal, which they enjoy; and it encourages them to eat more food—and full meals are essential for pullets which are in their first laying season. Even if they do moult it is probably so slight as to be hardly perceptible, and the birds seldom go right off lay. It must be admitted that, in autumn there is always the fear that the earliest pullets may drop into moult. It may be only what is known as a "neck moult," which is controllable; and I do not consider it as serious as an almost complete change of plumage. Nevertheless, it should be avoided when possible; and the best way to do so is to keep the very early birds in lay.

Some authorities suggest that it is best to let them slacken off after they have been at production for a couple of months and to give them a rest when they first show signs of a definite falling off lay. But as these birds have been grown for a much longer time than usual—compared with the spring-hatched pullets—there should be no break in their egg yield when once they are in their stride. I look upon the autumnal stoppage as something to be avoided rather than encouraged; and I endeavour to keep them at it until winter is on the wane, and longer if possible. It must be remembered that these birds are being kept solely as egg producers, and with no idea of breeding from them until they are well over their first laying season.

I aim at allowing them to moult in late winter or spring, so that they will get back into production again in summer, when some of the old birds may be broody or going off lay. When these pullets do drop into moult, the main crop of pullets should be laying steadily, and thus a good succession of eggs be obtainable. It is, in my experience, more of a problem to grow what may be termed the mid-early birds

—those which are hatched in February—and particularly if they are of the light breeds or of an especially quick-growing general-purpose laying strain. If the weather is at all hot and damp they generally forge ahead at a remarkable rate; and with ordinary range feeding I have known such birds to commence laying before they were five months old—and small eggs. The best way to manage these pullets is to keep them on the growers' mash, but without meat-and-bone meal in it after they are about three months old; and on such a mash until midsummer or later. For them the folding system might well prove beneficial with the frequent changes it incurs, since it is likely to hold up their laying until autumn. Some breeders aim at keeping them plump; but if they are on the lean side they will be the more likely to take to full laying rations without much breaking in. They must not be starved, of course; but they may safely be kept on the short side, provided they have a wide range.

The Spring-hatched Pullets

The growing of the March- and April-hatched pullets to their laying stage is probably the part of rearing which mostly interests the novice, because they are the birds he will be handling at first in preference to very early chickens or those which are not hatched until midsummer or later in the year. He will be well advised to select those two spring months as the period in which to get his main flock. In fact, until he has had experience at hatching and rearing, he will be wise to leave the very early and later hatchings to others. These spring pullets, then, when in their growers' range should be given the growers' mash with mixed grain, as mentioned above, to make four and then three regular meals *per diem*. The object should be to keep them growing rather than to feed them for an early egg yield. If they can be kept in hard fettle, there will be no lack of eggs from them when they do commence to lay shortly after they are moved into their permanent quarters about the beginning of September.

They must be well settled down in their laying house before they start production in autumn, which gives them an excellent chance of laying right through until the following spring without a break. If they are not drafted into them until late in the season, the change is almost certain to retard production, while if they are laying, as they are sure to be, it will give them a check for three or four weeks, or even longer. Always, therefore, get them accustomed to their winter quarters in good time. Most young fowls lay better when kept on the semi-intensive system during the dreary months than when they are allowed to wander where they fancy. It provides them with a dry and reasonably warm place, no matter how wet or cold the weather may be; and that is decidedly advantageous for pullets.

Changes which are made in their rations must be gradual. The wet mash should be decreased for some days before it is stopped, and started again in small quantities. Such changes should also be made according to the weather and the condition of the birds rather than to the day of the month. Nothing should be done to give them a check. Wet mash should never be given to them in a hot state; even on chilly days let it be just warm. Prepare it with hot water, but let it cool down thoroughly before they get it. The birds may safely have their fill of it, because they must be kept growing; its bulk will prevent their getting more of it than is good for them. Put it into long wooden troughs to enable all the pullets to eat in comfort; it makes all the difference when there is no fighting for a place. As soon as the necessary quantity of grain has been ascertained—as previously suggested—scatter it in such a way that they cannot get a mouthful at a time. The morning allowance of mixed corn will probably be under 1 oz. a head, and for the last meal of the day rather more than that quantity; but see that they clear it each time, and get enough to eat. Clean drinking water should always be within their reach; and limestone grit and shell should be allowed, as well as fresh green food, if these items are lacking from their range. Such a diet will suit pullets at range as well as those which are being kept in enclosed runs; but in this latter case be careful to see that the birds do feed well and take plenty of exercise.

Two or three weeks before they are brought into their permanent laying quarters it is a good plan to get them accustomed to the system of feeding it is proposed to adopt when they are required for egg production. It may be that which consists of grain for breakfast, dry mash during the day, and wet mash as the last meal—a method which I have found to produce good results in winter—or grain as the first and last meals, and wet mash at noon. But make these changes gradually. It means more work for the attendant; but it is always worth while. Too abrupt a change in feeding is apt to upset half-grown pullets; and nothing should be done that is likely to give them a check. Do not change over when they are on the point of laying. The great thing throughout is to give the birds plenty of sound food and to let them have the opportunity of exercising—get the birds fleshy and hard, then they will be ready for good laying.

The growing period of twelve weeks is the time in which the pullet is made or marred; it is the time in which she should gather stamina and vitality which

she will require later on. Any neglect then will almost invariably result in poor production when she is eventually furnished. The feeding throughout must be such that during the three stages—the starting, the growing, and the laying—the diets are blended into one, so to speak; that is, so gradually altered that there is no perceptible change. The birds will then always come up to their meals and enjoy them, rather than be put off by some food to which they are not accustomed. There must be no forcing and no periods of neglect; otherwise, even spring-hatched pullets will fall into moult at a time when they should be laying.

Mention has been made of feeding the earliest chickens by artificial light. I have never yet found it necessary so to feed growing pullets, even among the autumn and winter hatches. Let them have their fill during the day, as much as they care to eat. They have many hours through the night in which to rest, and they are not sleeping all the time either. But always be on hand early with their breakfast in the "short" days; and allow them plenty of time in which to fill their crops in the afternoon. They prefer to go straight to roost after their meal on winter evenings, rather than to take a last look around. One thing that should not be overlooked is that the cost of feeding the very best laying strain pullets need not be a fraction more than that of feeding just ordinary barndoors. Neither need be the cost of their rearing and upkeep in the way of houses. That it is so in some cases is a matter of individual taste—some breeders like to run their business on elaborate lines. But, on my own place, no money is wasted on trimmings. For the growth of chickens of any kind, the food must be sound; and it is really more important that they, rather than the actual layers which are bringing in the cash, do get sound food. Still, in neither case is it economical to give them poor quality food.

Causes of Chickens not Progressing

If there is to be success with chickens for egg production or stock, their development must be steady. It occasionally happens, when they reach what is known as the half-grown stage, that they begin to flag, or appear to be making no headway. Probably the most common causes that check growth are the indiscriminate mixing of the sexes; allowing the birds to run with adult stock; overcrowding; wrong feeding; and uncleanliness. I have mentioned the early separation of the sexes, and it is more necessary when chickens are being reared in somewhat restricted quarters than when they are on a wide range. In any case, though, it should be undertaken before the age of three months. The cockerels generally begin quarrelling among themselves as soon as they have felt their feet, as it were, while they are apt to bully the pullets at meal-times and generally get more than their share of food. This naturally interferes with the development of the females; and even if they agree amicably when on range, it often results in the pullets becoming too precocious and starting to lay long before they normally should commence. Their separation, however, requires a certain amount of judgment.

Cockerels may pine if they are taken from a free range and placed by themselves, even if put into a large enclosed run; but if they are separated when from eight to ten weeks old, and specially well fed at first, they generally soon become reconciled to the change and continue to grow. Another matter to note is not to allow cockerels to run with hens. This often happens when only two or three of them are being kept on for breeding purposes; but it is very much better to let them develop by themselves. Again, it is by no means rare for the half-grown pullets to be penned while the breeding birds are occupying free range. In most cases, however, when the half-grown stage of chickenhood has been reached, the adult stock may with care be kept fit in confinement. However, it is never advisable for anyone to attempt the rearing of chickens unless distinct runs with separate houses can be provided for them.

As a rule, most of the cockerels will have to be disposed of for table purposes; and it is a mistake to give them too much freedom. They should be kept in a small run, and so fed that they need take little exercise. Most of their food should be wet mash, while their grain can be given boiled, or soaked in water for a few hours. At any rate they may safely be put on such a diet when three months old. On the other hand, those cockerels which have been selected for developing into stock birds should be fed on similar lines to the pullets, because they must be in hard condition. In their case, therefore, they want more grain than wet mash; and if kept on a spacious grass run they may have an entire grain diet. It is most unwise to force them ahead and feed them on a diet which suits table chickens. A good foundation must be laid; and especially is it necessary for them to be hard-fleshed and vigorous. Keep them out of the sight of hens or pullets; but do not attempt to develop them in what are known as cockerel boxes. Let them be in the open; and give them enough room to get out of each other's way.

Exhibitors sometimes let a furnished cockerel run with a few old hens for the first two or three weeks as part of his training for the show pen; but, while this does suit birds of the light and active breeds, it is not advisable for others. However, for stock, I

keep the cockerels on range together, or each in a spacious run, until they are required for the breeding pen or for sale. They are well fed; and as they are accustomed to looking after themselves they almost invariably get their share of the food when they are mated up, and do not stand aside until their hens have cleared the trough. I have never yet found such cockerels shy eaters; but they are grand breeders.

Culling Pullets for Egg Points

Probably few novices realize the benefit of allowing their stock chickens sufficient room in which to grow. The experienced rearer is continually thinning out, weeding or culling his growers by discarding those which do not satisfy him. The beginner lacks such knowledge; hence his best plan is to do as I suggested earlier in this chapter and allow his chickens full-sized (adult) run space, from the time they are two months old. Thinning out a flock of growers is by no means an easy matter. One would naturally discard any undersized or sickly-looking birds—those which, though feeding well, never seem to grow—as well as others which may have such deformities as weak legs, knock knees, crooked toes, very round or "roach" backs, and wry tails. Such chickens as these, even though pullets, are useless for winter production; and do what one may with them—and I have often softened my heart to give them special treatment—they never grow up to a profitable maturity. Moreover, they are a source of worry to the healthy stock, and, too, a danger, because in the case of the puny birds or those which appear for ever sickly, they are quick to develop a cold or to catch any disease. Much better to put them out of the way.

There are, admittedly, rearers of laying stock who do not discard chickens with such weaknesses as crooked toes and wry tails, because these defects may not interfere with ultimate egg production. Nevertheless, perhaps because I come of "fancier" stock, I "scrap the lot." I was brought up with faith in the old-school fancier's axiom, "Breed well and kill well"—and if there were more killing, even in these days of economy, there would be vastly sounder stock among utility fowls than is the case at present. Breeders of famous laying strains know this; and it is because they are always culling their growers that they have built up such excellent reputations.

The culling of pullets for laying points can be undertaken only after considerable experience, that is, picking out the good from the bad while they are in their growing stages. The earliest age at which the novice should attempt it is three months. By that time the likeliest birds for production are those which are well feathered, showing little if any sign of baby fluff on the neck or under the wings. The wing feathers should be short and well clipped up, and when handled have the feel of feathers and not down. There will be no bare patches on the neck or shoulders; the whole body will be covered, and the tail evenly feathered. A pullet which feathers badly, in patches as it were, or with the plumage standing out instead of lying well to the body, never makes a good layer. Neither does one whose wings are so long that they almost meet under the tail, or which droop and pick up the dirt.

The eyes of a prospective layer are always prominent, set high in her skull, and without any thick or overhanging eyebrows. The head is well rounded, neither coarse nor fine; and the beak is short and curved as against long and straight like a wedge. She stands well on her legs, the bones being round and sturdy, and the feet well spread. When in the hand the flesh along her keel-bone will be firm, and the bone itself fairly well covered, although, naturally, it will not have the fullness of the pullet on the point of laying. Light-weight birds, those with very prominent keel-bones—"bladey," as they are termed—should not be selected when good layers are required. On the range, the most likely producers are those which are good movers, eating with a relish and yet always ready to hunt for oddments, even though they are dry mash fed. They seem to exercise to get an appetite, and the exercise certainly keeps them in condition, so that when the laying stage is reached they have the stamina to carry them through and can stand heavy feeding for heavy production. The good feeder is always the good layer.

Changing the Quarters

However, to return to those causes which check growth. A change of run will generally give a fresh stimulus to growth. Some poultry-keepers change their pullets to different quarters weekly, if any of the birds appear to be precocious and redden up for laying at a very youthful age. To make such changes then, however, with the idea of checking them and holding them back until egg prices rise, is a great mistake. The check at that period considerably upsets the birds' nervous system; and I have known it to have such a disastrous effect as to cause the whole winter production to be lost. Just treat the early layers as I have already mentioned; and trust to good management, if they moult, to get them quickly through it. Of course, there will have to be the move from the rearing ground to the winter quarters; but that will take place, as I have suggested, long before the pullets are in their first flush of production. Get the move over before laying commences. A change of run is most beneficial during the actual growing stage.

Where there is variety of land, much good can be done by selecting it according to weather; and thus, in a hot season, the chickens could be run in an orchard, while in a wet one they could be ranged where there is plenty of hedgerow protection. It is surprising how such a change does give the birds a fresh interest in life. It is possible even in a back garden by changing the birds from one side of it to the other. Even digging out the worn top of a small earth run and putting down a few barrowloads of freshly dug soil, is a plan which has been adopted with success when rearing in the very minimum of space.

Then there is the question of housing. Nothing is more detrimental to development than close and crowded houses. The open front plan of accommodation and the Sussex night ark have much to recommend them, after the hen or the artificial rearer has been dispensed with, and particularly when there are plenty of natural shelters and wind breaks in the range. Even in the old-fashioned cabin type of chicken houses the atmosphere can be kept fresh by leaving the doors and windows wide open day and night, the apertures being fitted with small mesh wire-netting on frames. In an orchard, or where hedge and bush abound, it is often the custom to let the growers sleep in the branches at night; but, while they are not likely to catch cold by sleeping out, and such quarters are decidedly preferable to a stuffy house, I do not encourage my young birds so to sleep. Too often it means that they make a habit of it; and, although it certainly hardens them, those which take to the trees as adults are very apt to cause trouble by trespassing. Moreover, when foxes are about—they can do much harm—the growers which roost outdoors may very likely leave their perches earlier than is good for their welfare. Much better, therefore, see them safely to bed in a good house when doing the evening round.

Another cause of growth being checked is parasitical vermin. This it really should be unnecessary to mention, because the beginner must know that absolute cleanliness is essential in the houses and runs. Chickens cannot possibly thrive if they are infested with lice. However, before the birds are tormented to any extent by insects they are weak or ill from some other cause, since strong chickens keep themselves free of such worries by natural means. Cleanliness of the sleeping quarters is important. It is a great mistake to allow growers to roost in the usual house where, night after night, their droppings are left to accumulate. It is a simple matter to keep their houses clean.

Bad feeding is a fertile source of half-grown chickens standing still or declining. "Anything" in the way of grain or meal will not benefit growers. It is true that small wheat and other grain which is unfit for grinding will do for them; but mildewed and heated stuff should be avoided—there is little nourishment in it, fermentation takes place, and digestion is utterly deranged. A bird cannot thrive, much less grow properly, when its digestion fails. Buy sound corn and meal and store them in a proper place; observe cleanliness in the food room, and, if the sacks are not returnable, see that they are thoroughly emptied by turning them inside out and giving them a good shake. Then hang them over a rail until they are required —they come in very handy during the chicken season and can be utilized in many ways.

Sacks left on the floor or a shelf, with a little meal or corn in them, are apt to attract mice; and mice pollute chicken food. If the meal and grain have to be kept in sacks—tin-lined bins cost little—make a special platform for them, well away from the walls, and on stout 1 ft. legs, tarred, and fitted to the platform through inverted flat cigarette tins. The tins prevent the mice getting beyond the legs, while the space allows the cat to roam around. However, to return to the feeding of growers. If any of them become dainty without any apparent cause, the omission of a meal will generally sharpen their appetites and cure satiety. The keen poultry-breeder will soon observe when his chickens flag or fail; and he will almost intuitively see the cause and apply the remedy.

Early Laying

One other little matter may be mentioned, and it applies particularly to those who are rearing stock chickens—get them tame. Give them personal attention, and do not hesitate to handle them. Even laying fowls give better results when they are tame than when they have been brought up wild. Rearing chickens in this way will do much towards making them familiar with man; and not only will they, when furnished, be easily handled by a stranger—a great point in their favour when exhibiting young birds or disposing of them for stock—but they will settle down without trouble in the breeding pens. Remember, also, that pullets must not be forced for early laying. I know well enough that a quick return for capital invested in rearing pullets is desirable within reason; but there is really no sense in trying to get the birds into lay as soon as they have shown their combs.

It is a great mistake when bringing pullets along, in feeding them in what the experienced poultryman terms the growing stage, to give them a diet similar to that allowed to adult birds which are laying heavily. Animal matter in the form of fish meal or

meat meal is beneficial, but, if carelessly used, it leads to trouble. There are generally warm days in the latter part of spring; so if Nature is hurried and unduly aroused into activity by a forcing diet, the growth of the body will be impeded and the eggs will be small. To prevent early laying it is a common practice to shorten the rations. However, a liberal diet should always be allowed to growing fowls, but it must be a bulky one, not concentrated, i.e. more home-milled bran and fine weatings (middlings, etc.) and very little, if any, meat. Bulk mash No. 2 under the Feeding Time-table No. 4 is advised. Well bulked food ensures large crop capacity, and that means plenty of room for a proper amount of food for the future egg supply. Heavy layers are generally large eaters, hence they must have capacity for food to meet the demands of supply. I know well enough that deferred laying is a serious matter to some people, especially to those who are depending on returns at a time when eggs are at top prices; but it is folly to rush things.

From an egg producer's point of view, early laying ought to be prevented; or, rather, laying at too early an age should not be encouraged, because if allowed and the birds are bred from, it is almost inevitable that, in time, there will be loss of size in the stock and the eggs, and loss of stamina. Small eggs are quite plentiful enough in some laying strains to-day, while lack of stamina is evident at hatching time. Growing pullets should be well fed, but their diet should be for growth and not for early egg production. It is a mistake to expect pullets to start laying before they have developed sufficient strength to stand the heavy drain on their system of continuous production of marketable eggs—those of standard weight. Early laying may be an inherited characteristic, but it can be encouraged or brought about by wrong feeding—I have, in my experiments, had pullets laying at four months of age, which is, nevertheless, most undesirable. A plain diet, such as I have detailed in this chapter, will do much to ensure bodily growth rather than too early functioning of the egg organs.

It requires care to get pullets fit for laying saleable eggs within a week or so of the start; and it is not an easy matter to manage the earliest birds so that they can be profitable autumn and winter layers. Until one gets into the way of things all the attention required by chickens appears to leave one little time for idleness—it looks like all work and no play. But, while the growing of pedigree stock is a specialist's job, the rearing of chickens need not present insurmountable difficulties to the novice. It means nothing more than using common sense and working to a system. Certain it is that, once the rearing of the birds has been mastered, the novice will have solved one of his greatest problems.

Average Weights of Chickens

In concluding this chapter of feeding and development, it will be of service to the beginner if I mention the average weights of chickens reared for stock and table purposes. As a rule, there is not a vast amount of difference in the weights of chickens up to six weeks which are being reared for laying or stock. That is, whether they are of the light and non-sitting breeds, or of the heavy and general-purpose kinds, they average, at that age, around 12 oz. to 14 oz. From then onwards, however, there is a noticeable difference; and by the end of three lunar months (twelve weeks) the former will be 2 lb. to $2\frac{1}{4}$ lb. and the general-purpose birds 3 lb. to $3\frac{1}{4}$ lb. Well reared and early hatched chickens may surpass these weights, because I have had three-month-old growers of the heavy breeds which scaled 4 lb. and non-sitters weighing $2\frac{1}{2}$ lb., while other breeders have probably done better than that. And, of course, cockerels almost invariably outstrip pullets, especially from six weeks onwards.

As showing what can be achieved with chickens which are being specially reared for market, experiments were carried out some time ago, and the average weights were as follows: One week old, 2 oz.; two weeks, 4 oz.; three weeks, 6 oz.; four weeks, 10 oz.; five weeks, 14 oz.; six weeks, 1 lb. $2\frac{1}{2}$ oz.; seven weeks, $1\frac{1}{4}$ lb.; and eight weeks, 2 lb. These are remarkable weights; but the figures were obtained from a thoroughly reliable source. The birds were ordinary Sussex crosses which were bred, reared, and fed specially for market. The beginner should not worry, nevertheless, if his chickens do not advance at such a rate; in fact, if rearing them for stock, he will not attempt it. Just feed them well and they will develop properly.

CHAPTER VIII

THE MANAGEMENT AND FEEDING OF LAYING FOWLS

ONCE the pullets have been successfully brought to the laying stage, by careful management throughout the months in which they have been grown, the endeavour will be to keep them steadily laying from the day they produce their first egg until they have recompensed their owner for the time and trouble he has taken and the expense to which he has been put in their rearing. That is the very least the pullets should do; but if that were all they could possibly accomplish, then I am afraid there would be comparatively few poultry-keepers who would go in for chickens. In fact, if that were the limit of their capabilities, the number of people keeping fowls would probably be very small indeed. Much as one does enjoy a hobby, more than ever is it necessary in these days to make that hobby remunerative. And so it is with fowls.

Not many years ago one frequently heard the remark, "Poultry don't pay"; but that was simply because so few folk attempted to make them pay. They were content to keep fowls as a fancy, for show purposes or for the pleasure of having a few new-laid eggs, irrespective of what the birds cost to keep. Nowadays, however, there is no excuse for properly tended poultry being kept at a loss. That there are losses must be admitted; but, even when failures occur in quarters where one would least expect to find them, they can generally be traced to carelessness. It is so in my own case; I do not mind acknowledging it. What few failures I have had have been due to nothing but lack of care—thoughtlessness, overlooking something. And I am not alone in that respect. There is no such thing as bad luck with fowls; it is the management, not the luck, which is bad. At least that is so ninety-nine times out of a hundred.

This applies particularly to pullets; they must be well managed, especially when they are coming into lay. And the management must include understanding. They are nervous little creatures at times; and the slightest thing out of the ordinary seems to upset them. One of the greatest mistakes in their management is to change their quarters just after they have commenced laying. I would much rather allow them to remain on the rearing ground, no matter how unsuitable it might be for the maximum of egg production in winter, than change them over as soon as they begin to lay.

It is for this reason that pullets which are sold as "just on the point of laying" are often so disappointing to the purchaser, and such birds when they are sold in autumn do not produce as many eggs as they undoubtedly would have done had they been kept on the range or in the run with which they were familiar. Even when a January-hatched pullet has got into her stride in September, that is, when she has been laying steadily for some weeks and appears to be settled down to business, a change of locality at that time almost invariably has a detrimental effect on her and puts her clean off lay. To such an extent may this happen—although, perhaps, she is taken from a wide range and put into a grass run—that, even in the most experienced hands, it may be several weeks before she becomes accustomed to the change and gets back into lay again. If it does not send her into a full moult, it may even retard production until mid-December or later. Laying pullets can generally be chopped and changed from one place to another in spring and summer without upsetting them to any extent, if at all, as regards production; but it is a great mistake to attempt it in autumn and winter when they are in lay.

This is where understanding comes in. The slightest change of conditions, so small a thing as a change of attendant at that time, is very apt to put pullets off lay. When we moved to the present farm one mid-August and brought the stock along, it made little if any difference to the growing pullets which had been hatched in March and April; but, as some of the January birds had started to lay before the move was made, production ceased before a week was out, and it took us the best part of six weeks to get them settled down again and in lay. Of course, I knew that this was almost inevitable; and had it been possible for me to have kept those pullets off lay I should have done so. But as I never attempt to check birds when once they have started, I had to put up with the loss. As it was, the March pullets easily beat their earlier hatched sisters that winter.

The first consideration in the management of young laying stock, therefore, is to get them thoroughly settled down to their winter quarters before they come into production, and then to disturb them as little as possible when once they have started. Those who have never had anything to do with the growing of pullets are too apt to mislead the beginner in this matter. They often advise him to cull his young birds in autumn and winter when they have been laying for some weeks, to select the best for breeding. But

that advice is entirely wrong, because not only is it a great mistake to breed from such young stock, but the disturbance created in the selection has a detrimental effect on the others. It means much to get the birds accustomed to their laying quarters and to their attendant; and for this reason it is certainly advisable, when pullets have to be purchased, to obtain them in their growing rather than in their laying stage.

Suitable Accommodation for Winter Production

Housing, of course, has not a little to do with production, and particularly in winter, which, as most people are probably aware, is not the natural laying season. Long before the pedigree breeding of layers was understood and modern methods of accommodation had come into vogue, it was not altogether rare for pullets which had been hatched early in spring to commence laying in winter. As a rule, the birds were of the heavy or general-purpose kinds, because, in those days, the light varieties were considered to be of little use in that respect, producing the bulk of their eggs during the spring and summer, although I have before me an authentic account, dating back to 1835–36, of three Poland pullets—a breed which is now almost extinct—who began laying in December of the former year and produced no less than 524 eggs to the end of the following November.

However, in my early years, although winter laying had not been developed to anything like the extent that it is to-day, it was not unknown. This was not achieved by scientific feeding, because science in connexion with the keeping of poultry was little heard of at that time. It was simply the result of providing the layers with comfortable quarters, where they were well protected from rain and winds, and plenty of dry litter in which to scratch, and were given generous allowances of warm food and food which produced warmth. Such, one might say, is what pullets require to-day—comfortable quarters and sound food for steady production in winter. It is more important that the young birds which are just coming into lay, rather than the seasoned hens, should have such accommodation, although not a little will depend upon location.

There is, in fact, more in location for winter production than many poultry-keepers seem to imagine. While I was residing in Surrey, my fowls were kept in a very well-protected situation; and during one of the most severe winters we have had of recent times, a pen of pullets gave excellent results with no more accommodation than a Sussex night ark and having to find what shelter from rain and snow was afforded by some bushes and fruit trees. During the worst weather, their food—grain and wet mash—was put into troughs under a 2-ft. high open-sided affair I rigged up specially for the purpose, with the sole idea of keeping the food clean—I do not fancy throwing grain down in the snow or on soaked land. Some of the birds would shelter there during a heavy downpour, and others would seek the ark. It was a severe test, but they gave very satisfactory results. I attempted similar treatment with their daughters, hardy stock, on my present farm; but this is an exposed place and stands high, consequently I was forced to build a shed for them in winter, and production was nothing like as good. Here, indeed, we find it is imperative to adopt modern semi-intensive houses for the pullets which start laying in autumn, although the arks suit growers, seasoned hens, and breeding stock.

Avoid Damp Quarters

Towards the fall of the year there is probably nothing more dangerous to the general health of pullets than forcing them to roost in a damp and draughty place. A leaky roof in a house that is otherwise soundly constructed is conducive to dampness; but this should never be allowed, because it is a simple matter to keep the roof watertight by means of a coat of tar and the use of reliable roofing felt. Condensation from a galvanized iron roof is also a source of dampness; in winter it is covered with beads of moisture which fall on the floor litter, hence all such roofs should be underlined with wood. Damp rising from the ground, which is common on soils of a clay nature, is more difficult to contend with; and in this case, the house should be located on the highest part of the land, and with the floor well above the level of the surrounding ground. Whenever possible I prefer the floor to be of earth; but while this can be managed on light soils of a porous and sandy nature, a wooden floor is well-nigh imperative in the former circumstances. Even then, nevertheless, it will not prevent damp from rising and permeating the house unless it is eighteen inches or more above the ground and coated underneath with a mixture of pitch and tar.

I have at times drained the site for the house by digging out the surface a spade or more deep, and filling in the cavity with rubble and clinkers; but a substantial wooden floor, treated as I suggest, is decidedly convenient, as it permits of the building being removed with the floor complete. Ventilation of the laying quarters has also an important bearing on autumn and winter egg production. Fowls require a large amount of oxygen, because they have no sweat glands and moisture is therefore given off in the breath. Consequently, an adequate quantity of fresh air must be admitted to the house; but care must

be taken to arrange the windows in such a way as to prevent rain being driven in to soak the litter—a common cause of sickness among pullets. Moreover, on no account should their perches be where there are chinks in the walls, due to the tongues of the match-boarding splitting—by no means rare nowadays when so much unseasoned wood is used for the construction of fowl houses. There will be times, in winter, when bad weather and cold winds render it almost impossible for the pullets to exercise in the open; hence the great benefit of providing them with a suitable house in which they can work and thus maintain vigorous health.

The Pullet Moult

Always get them settled down to comfortable quarters well ahead of the time they should commence to lay; then they can be brought into production and kept at it. In the preceding chapter I mentioned about avoiding the moult. Pullets generally moult, in that they change from their chicken-feathering to more mature plumage, and apparently they get their full covering when they are between five and six months old. They undergo this moult whether they have laid or not; but after that age they do not, as a rule, cast any more feathers as long as they continue producing eggs. When they cease to lay, some begin again to moult. The moult may then be complete or partial—a few feathers from different parts of their body. Of course, when fowls are fully matured, they have to pass through the moult once a year, generally at the end of summer or the beginning of autumn.

One very important item in the management of pullets is to prevent their dropping into a full moult in autumn after they have produced a batch of eggs. This applies more to the early hatched birds than to those which are not out until spring. But, granted they are not brought along in such a way that their ovaries are encouraged at the expense of their bodily development, the moult can generally be avoided, or, at any rate, delayed until the season of high prices is over. It really amounts to no more than housing them in a healthy manner and paying strict attention to their diet. Those poultry-keepers who are working on small lines may find it difficult at times to prevent early laying; but if their birds are made to exercise, and the diet is not over-stimulating, they can generally be kept growing until they are sufficiently developed to produce marketable eggs.

There are now four grades of eggs, and allowance is made for those laid by pullets, which, standardized as "pullet" eggs, must weigh at least 1½ oz. The first produce of the pullet, nevertheless, need not be of such a light weight. This, the size as we term it, depends upon the age at which the bird begins to lay, provided she is not bred from a hen which lays small eggs, and that she has not had a check in the period of growth. Pullets which start laying when they are practically in their chickenhood invariably produce small eggs; and they continue to do so until they have completed their first batch of eggs or until they fall into their first full (adult) moult. Sometimes, in fact, they produce small eggs during the whole of their laying career. To develop pullets capable of laying marketable eggs in winter is the aim of most poultry-keepers who rear stock for egg production; and, with this object in view, the endeavour is to get the birds ready to begin at the end of September or in the first week of October.

During recent years vast improvements have been made in laying qualities; and yet, with it all, the fact remains that, given the most carefully reared broods of pullets of high pedigree laying strain, it is impossible to hit on a system which will result in the whole of the birds starting to lay at the right moment and beginning with full-weight standard or special eggs for the very top trade. I long since came to this conclusion after experimenting in every known direction and carefully studying the question in all its phases. It simply means that, while some writers do refer to prolific layers as egg-machines, there is nothing mechanical about hens. I mention this matter so that the beginner will not be discouraged if some of his pullets come into lay while others of the same batch are still growing.

The Blood Age

The best that can be done is to breed from sound stock of proved ability, and to pay close attention to the birds throughout their period of growth, and particularly when they reach what is known as the "blood" age—that is, when the pullet's blood is concentrated chiefly on her ovary. This is a most critical part of the pullet's life. Where so many rearers are apt to fail—and they are not always novices, either—in the feeding of their growing stock is to give the birds a fattening or an over-stimulating diet as soon as they redden up. The ovary is thus prevented from developing in a natural manner; either it is clogged with fat or it is stimulated to such an extent that it breaks down, and blood instead of yolk material is the result. During my post-mortem work I have examined pullets whose ovaries were practically nothing but fat, and others in which minute ovarian capillaries were intensely swollen or ruptured, or the ova contained nothing but blood, as a result of faulty feeding.

Most poultry specialists are probably aware that embryo eggs exist in the pullet from birth; that is, as soon as the female chicken is out of her shell she

has what in the natural course of events will develop into "hen fruit." The organs of reproduction, however, are dormant until the bird is at least four months old. Then the oviduct—which in its earliest stage is very difficult to locate by an untrained eye—becomes distended, and there is a simultaneous movement of it and the ovary. Up to the age of four months or thereabouts—the exact time varying according to the class of fowl, and differing also in pullets of the same family—all the blood in the system is required to "grow" the chicken; but from then onwards it is concentrated chiefly on the ovary, and in from six weeks to two months the first egg should be matured.

Detecting Good Layers

The novice will undoubtedly find it a somewhat difficult matter at the beginning to detect the good layers; but after a little study and close observation it should become comparatively easy. When a pullet is about to commence her profitable career—as the laying period should be—her comb and wattles increase rapidly in size, her head appears fine and rosy, her eyes are bold, and the bird has an altogether bright and alert appearance. She is always ready and quite eager for her food at meal times, despite the fact that she is ever on the search for some tit-bit. To the expert eye, the first signs of good laying are observable in chickenhood; and I have invariably found that female chickens which eat heartily, exercise with spirit, and feather reasonably early, develop into better layers than other birds of the same brood. A good layer is always a big eater; on handling her it will be observed that her crop is rarely empty, her abdomen is soft and silky, her gizzard can be felt distinctly, and other of her internal organs are freely movable. If, on handling the pullet, her abdominal cavity is full and hard—reminding one somewhat of a bladder of lard—she will be in too fat a condition to produce large or normally sized eggs. Hence, unless she is of a particularly valuable laying strain, it will be much more serviceable to transfer her to the fattening coop than to attempt thinning her down. There must, naturally, be a certain amount of fat in her abdomen; but when that part is very baggy and firm it is a sign that she is too fat.

It is a common occurrence for pullets which are on the point of laying, fruitlessly to visit the nest; and no doubt it is equally puzzling to them as to their owner. As the time approaches for them to commence laying they may be somewhat sluggish in their movements. This languor may be accompanied by other indications, which have their origin in the disturbance through which the reproductive organs are passing at the time. The disturbance accompanying ovulation may be local, that is, situated in the region of the ovary and oviduct; or it may be reflex, which means reflected to some other part of the body. But if the bird is healthy and vigorous, there is no likelihood of her being egg-bound. When commencing to lay, the pullet is perhaps somewhat erratic in the exercise of her newly-found function. This is due to the fact that her system has not adapted itself to the increased activity which comes into being with the commencement of ovulation. There is considerable blood pressure in the ovarian region, which causes the funnel-shaped entrance of the oviduct to dilate in order to catch the suspended ova or yolk about to escape from the ovary. Each contraction and dilation occurring at the funnel end of the oviduct is felt along the whole extent of the highly sensitive and delicate egg-tube or channel. It is a rippling motion, and helps to propel the contents of the oviduct to their destination—the nest. Each ripple gives the expectant bird notice of the movements of eggs in the process of manufacture, and, naturally enough, the pullet visits the nest.

A Useful Tonic

When, however, the pullet is sluggish in her movements, it proves that the strain her physical powers cause by the establishment of the reproductive functions is more than can be borne without some degree of failure. This temporary weakness of the bodily powers takes various forms, according to individual constitution; hence the reason why some pullets at that period are, as some folk say, "slow, and queer in the head." I do not believe in forcing pullets to lay, even if it were possible, or interfering with the course of Nature. Nevertheless, if there is any slight trouble about the production of the first eggs—as, for instance, when a pullet continually visits the nest and does not lay—it will prove beneficial to give her an aperient. For this purpose sodium sulphate can be employed. Dissolve Glauber's salt at the rate of 4 oz. to one pint of warm water, and add one tablespoonful of the solution to each pint of drinking water. Allow it every third or fourth day (not more frequently) for a fortnight or so, putting fresh water down daily. Nature in due course regulates the process and its attendant warnings, with the result that the bird visits the nest only for the purpose of depositing an egg therein, and does not require any assistance.

Some poultry-keepers resort to spice and condiments; but, while they may be serviceable, they have to be used with great care, otherwise they are very apt to derange the reproductive organs. I certainly prefer to give the birds a mild liver tonic as mentioned above. This tonic, I may add, is quite useful to administer twice a month with a four-day interval,

at the height of the laying season, to birds which are being kept on the intensive system, and when there is a shortage of fresh green food. Still, there should be no need to give anything of the sort to pullets which are correctly fed and well managed. It is suggested for use merely when the birds are coming into lay, and then simply for those pullets which appear to be in difficulties.

It has been said that the rearing of pullets consists of one-third breeding and two-thirds feeding. It may be so. There must be reasonably good breeding for profitable egg production. And yet, unless the feeding be correct, breeding will not produce the desired results. On the other hand, the best of food and the most careful management will not ensure maximum results if there be not in the bird the power to produce a profitable output, although vast improvements can be made by the correct feeding of quite mediocre pullets, as I have frequently proved. However, maximum production must be the aim if the pullets are kept solely for laying. A well-known breeder of pedigree stock for egg production once remarked to me that the best way he had found to rear pullets is to get them fat and keep them fat for four months, and then to get them hard and keep them hard for twelve months. I prefer to keep them hard right through, since, although they must certainly be in good hard condition as they begin to lay in autumn, fattening them in their early stages, before they arrive at the "blood" age, may considerably interfere with the ultimate functioning of their reproductive organs. Feeding is, undoubtedly, one of the most important factors in egg production. Good, wholesome food is necessary; but the rations must be suitable, and, what is more, the food must be palatable.

Scientists tell us that a complete diet for the average human being should be a combination of materials which provide carbo-hydrates, fats, protein, water, mineral salts, and half a dozen or so vitamins. No doubt it is so with poultry; these substances must be present in sufficient amounts to maintain life and to ensure activity of the bird, while the diet must be one which enables the layer to provide the best egg yield. But, granted it is so, it is most unwise to imagine that excellent results can be obtained only by adopting a formula prescribed by a theorist with the scientific bent. Practical poultrymen know that the whole subject of feeding fowls resolves itself into adopting the method which will give them the best return for outlay. They also know that, while the object is the production of the maximum number of eggs, there is not one system, and one system only, which will answer in all circumstances.

Estimated Output of Eggs

In a natural state, that is, running at large and getting only what food she can find, the hen is a poor layer. But, although the ovary of the so-called high-fecund pullet consists of innumerable ovules compared with that of the wild hen, it is folly to imagine that, because the bird has been bred to lay, she can be made to produce several thousands of eggs by scientific feeding. I have already stated that embryo eggs exist in the pullet at birth. The day she is hatched she has in her all the ovules she can ever develop into eggs from the time she is furnished until her days are ended. It is impossible to increase the quantity of ova of which the ovary is composed; that is, one cannot add ova to the pullet's body by special food. But it is possible, by correct feeding and careful management, to ensure many of the ova or minute yolks ripening and thus eventually developing into eggs. So far, nevertheless, no one has discovered a method whereby every ovum can be encouraged to ripen and take the form of a fully-shelled egg; and despite the remarkable records which some pullets have made in their first laying season, no hen has succeeded in producing 2000 eggs, no matter what her age.

As a matter of fact, the vast majority of the ova of the most prolific layer never ripen at all but perish. Wild statements have been made as to the number of eggs for which a fowl with the inherited high fecundity factor should be "good." Scientists and others tell us that the ovary is composed of thousands of ovules—which statement I am not prepared to dispute, because it is beyond me to say just how many ovules the ovary contains. However, a French scientist once asserted that a hen is capable of producing about 700 eggs—a modest estimate, admittedly, according to recent statements—and that, in a natural course, they are distributed over nine years in the following proportions: First year, from date of hatching, 15 to 20 eggs; second year, 100 to 200; third year, 120 to 135; fourth year, 100 to 115; fifth year, 60 to 80; sixth year, 50 to 60; seventh year, 35 to 40; eighth year, 13 to 20; and ninth year, 1 to 10.

Of course, by good breeding, sound management and correct feeding, pullets have produced 200 and more eggs in their first complete laying year—that is, from the time their first egg was laid—and repeated that performance in their second season. A few have even laid well up to five or six years of age. Hens, of course, can live to a ripe old age—for poultry—and in a special section of the World Poultry Congress, which was held at the Crystal Palace, London, in 1930, I saw some whose ages, sworn to by affidavit, ranged from fifteen to twenty-four years—although,

no mention was made of the number of eggs they had produced, while some I handled had been off lay for several years. However, the greatest number I have ever known to be produced by one hen was recorded of a nondescript bird of Sussex, which, when rising eleven years, had the almost unbelievable total of 1425 eggs to her credit, but not, let me add, in an official laying test. This famous hen, "Betty"—her photograph appeared in three or four daily newspapers and weekly journals at the time—was reported to be "still laying," and the figures were verified by a well-known poultry authority. Hatched in 1903, her remarkable total was made up as follows: 1903–4, 218 eggs; 1905, 206; 1906, 201; 1907, 196; 1908, 187; 1909, 170; 1910, 131; 1911, 60; and 1912 (up to 23rd June) 56.

For commercial use, nevertheless, a hen, as a producer of market eggs, is considered to be unprofitable after her third season. As it is, the vast majority of hens are discarded by commercial poultry-farmers for "eggs only" towards the end of their second full laying year. If layers are given sound food and kept with the sole object of egg production, they will be profitable for two seasons at least, after which they should give entire satisfaction for a year or more as breeders. The great thing is to let them be well furnished before they commence to lay—six to seven months, according to whether they are of the non-sitting or general-purpose class. There is much in feeding them so that they shall not become unduly fat during their off season, or lose energy while they are producing eggs.

Some Record Batches

Probably most folk know how the eggs are actually laid; apparently, few are aware that they are produced in batches. Too often it is thought that the pullet lays an egg daily from the time she begins production until she is a year or more old, at which age she falls into her first adult moult. It would no doubt be most satisfactory if it were so; but this is not the general rule. In a state of Nature, that is, running wild, the hen produces as many eggs as will form a nest; she then becomes broody, sits on the eggs, and rears the chicks. All this, admittedly, has been changed by domestication and selection. Nevertheless, to a certain degree Nature still has something to do with the matter since, while "nests" are larger and the intervals between the batches have been very considerably reduced, there are periods of rest other than those which are required for moulting.

Some first batches may consist of a dozen eggs only, while others may be as large as a hundred or more. There are, of course, records in this direction. One is of a pullet which laid for seventy days without a stop, and then, after a week's rest, started again. Another is of a White Wyandotte pullet which, in a well-known laying test, laid 115 eggs in 115 successive days. A third is of a Light Sussex pullet which began laying on 19th November, and from that day to the following 10th July laid an egg a day continuously, excepting on five days. Of this pullet, her owner said that she had been broody twice, but laid all through her broodiness; and although she was moulting, she was still laying an egg every day, her total up to the day he wrote of her being 230. Other laying test records are of a Rhode Island Red pullet (Yorkshire) laying 311 eggs in forty-eight weeks (336 days), and only twelve second-grade among them; and a White Wyandotte pullet (Cornwall) producing 310 eggs in fifty-two weeks. But perhaps the record is held by a White Leghorn (Vancouver, British Columbia) with a total of 357 eggs in her first laying year.

It is necessary to add, however, that these are exceptionally good results, as it is certainly not the rule for pullets to put up such records. However, they show what can be accomplished. Good layers generally begin their career by producing a batch of eggs numbering a score or more, at the rate of one *per diem* in succession, and, before they settle down to serious production, they rest for a few days. Some start by laying on alternate days, while there are those which rest for three or four weeks after laying their first batch. The pullet which runs up a score or so of eggs in as many days at the beginning can generally be depended on to develop into a prolific producer.

It is the general opinion among poultry-keepers that the female fowl, considered solely as a producer of market eggs, ceases to be profitable after her second year of production, while some commercial poultry-farmers discard their laying stock after they have the first year's output from the birds, that is, they keep pullets only. To get from the stock the quantities of eggs which must be obtained to make the business yield a living, the birds are highly fed, which means that they are probably overfed, simply because it is difficult, even with the best diet, to ensure that what the pullet does not need for her bodily upkeep shall, as it were, go into eggs only. A considerable percentage of the diet is, naturally, required to keep the bird fit; and the eggs are made from the surplus when she has extracted what she must have for her bodily warmth, energy, and replacements. It can be imagined, therefore, that prolific egg production depends primarily upon the feeding of the layers; hence, feeding for maximum production is, practically, making the pullets eat the maximum quantity of food without actually killing them.

The High Fecund Factor

It has been said that the best of food and the most careful management will not result in prolific production unless the pullets have inherited the high fecund factor, and that there is no method whereby the "dud" can be persuaded to fill the egg basket. As a matter of fact, high fecundity as an inherited factor is much misunderstood and has been vastly overdone of recent years; and it is this, combined with excessive feeding, which is causing so much trouble among laying strains at the present day. What breeders of laying stock should aim for as an inherited factor is not so much high fecundity as high digestibility —fowls which have the power to work vigorously and assimilate their food in such a way that they can keep up their stamina while producing eggs.

This is a vastly more valuable factor than high fecundity, since, given a flock of robust pullets, they can be fed for satisfactory production, even though they are not the daughters of record-breaking hens. If, therefore, pullets which some breeders term "duds" are of sound constitution, there is no reason why, with correct feeding, they should not contribute to the egg basket to such an extent as to prove profitable producers. The vast majority of genuine "duds" among layers are failures because they are lacking in stamina—vigour, strength, endurance—and much of this is due to faults in breeding for high fecundity. It is useless to attempt feeding pullets for egg production unless those birds are strong at the commencement of laying; and they must be kept strong right through their laying period if they are to yield the maximum of eggs. This strength, the vitality which enables them to keep energy while contributing freely to the egg basket, depends entirely upon careful management, which, of course, includes careful feeding. And in this matter there is a vast difference between pullets and fully matured hens.

FIG. 139. PREPARING FOR THE FOOD ROUND

A scene on a Hertfordshire poultry farm, at which the layers are accommodated in field houses. At many large farms nowadays much of the work is done by poultry maids; and poultry farming is certainly a suitable vocation for young women. By the use of a hand cart, such as the one shown, much labour is saved both in watering and feeding the flocks

There are times of the year when the latter will produce their quota with but scant attention. As proof of this, hens I have at present (September) of no "high fecund" strain but just what some writers would probably term "duds"—they were bought at a cheap rate in their pullet stage—are ranging with some late-hatched bantam chickens and turkey poults, which they should have left long since. Yet these birds, getting from the range what they can find, and no doubt partaking of the growers' mash and grain, are laying well; some of them are producing an egg almost daily, and this, too, after giving most satisfactory results during winter and spring. However, they were "bred strong" and have been kept fit while being fed for eggs. This should be the beginner's aim, so to feed his birds that the production of eggs does not lead to weakness and lack of vitality.

Feeding by Analysis Tables

Some people refer to the feeding of poultry as a science, others as an art; but since I do not wish to discourage the thousands who are neither scientific nor artistic, I prefer to regard it as a subject in which common sense plays a leading part, and study will be well rewarded. In the old days, the average poultry-keeper did not trouble much about the composition of foodstuffs; neither did he attempt to balance the rations for his stock. If he did not leave these matters to those who manufactured poultry food, then he accepted a formula which had given someone else good results. But since there is not one system and one system only which will answer in all circumstances, the beginner will be wise to experiment with different diets to discover just what suits his own special conditions. After all, working out a ration by the aid of analysis tables is not too great a problem to be tackled; and when large flocks of layers are being kept it is decidedly beneficial to know how to change the diet when it becomes necessary to do so. Of course, the expert feeder has sufficient knowledge of foodstuffs to differentiate between good and bad; and such knowledge is of great value.

However, those who wish to fix likely feeding rations for their poultry can do so from the average analysis figures in the table on page 216, which gives the approximate percentage of the nourishing and other component parts of various foods which can be employed. They will act as a safe enough guide on which to base calculations of dietary, even though different samples of the same food may vary slightly in analysis according to quality. It is as well to recollect, nevertheless, that chemical analysis alone does not supply the means of feeding any live-stock for maximum efficiency. It requires practice and observation to get the best results. Hence the need for study and experiment.

In addition to the meals mentioned in the table, others can be included in the dietary of poultry, such as proprietary laying, etc., meals, analysis of which cannot be given here but can probably be obtained from the makers. Because of their chemical composition and special uses as food, all food elements are divided into groups, so that foodstuffs may be said to contain five essentials, viz. water, which is always present, no matter how dry the food may appear, ranging from as low as 7·3 per cent (as in dry malt without sprouts) to 94·3 per cent (as in lettuce); protein, consisting of albumen and other nitrogenous compounds; carbo-hydrates, non-nitrogenous compounds, like starch, cellulose, sugar, and glucose; fat or vegetable oil; ash or mineral matter.

The Component Parts of Food

A short explanation of the terms used is all that is necessary to assist the reader to understand the analysis table. Protein is a complex nitrogenous compound which is the most valuable constituent of all food. Animal protein (contained in meat food) is considered more valuable and more perfectly digestible than vegetable protein. It has been shown that some animal food is necessary for health. It differs from vegetable protein, and vegetable matter will not completely take the place of animal matter. Protein, besides being the most valuable, is the most costly. It also has the widest range of uses within the body. Its chief value is a tissue builder; it furnishes material for tissue-building and repair, and contributes largely to the manufacture of eggs. It is also convertible into fat and heat. The waste from protein is more dangerous and more difficult to get rid of than that of other food constituents; so that, apart from an economical view, it is unwise to make a practice of giving a very narrow (excessively nitrogenous) ration.

Fats are available for energy, for work and heat, and may be stored for future use, or so disposed of as to be of service as insulators to protect the body against too rapid loss of heat. They serve as fuel for growing and working cells. The fats are carried to the cells in the form of minute fat droplets, and undergo chemical changes within the cells before being deposited in storage as fat tissue. The fats also contribute to egg formation. Fats are important food, and necessary to life and health; but an excess of fatty food is not desirable.

Carbo-hydrates are chiefly heat producing; they supply fuel energy to be converted into warmth and heat, and it is doubtful if the carbo-hydrates are available for any other purpose. It is thought that they cannot be converted into heat, but act rather as a fat-saver by furnishing fuel to be consumed in place of fat. The liver, besides manufacturing bile for use in digesting and assimilating food, seems to act as a manufactory and storehouse of partially converted carbo-hydrates; and it deals them out in the form of a partially converted starch which is readily convertible into a sugar easily assimilated by the tissues. When carbo-hydrates are greatly in excess, as in a too starchy diet, the liver is overtaxed and fowls get so-called "liver disease." The main difference between carbo-hydrate and fat is that the former is burned up quickly, while fat is a more sustaining fuel. It is worth noting that 1 per cent (one unit) of fat is equal to 2·29 (practically $2\frac{1}{4}$) of carbo-hydrate.

Ash or mineral matter is found in all foods; and it is usually considered to be in sufficient quantity to

AN ANALYSIS OF FOODSTUFFS

Foodstuffs	Protein	Fat or Oil	Carbo-hydrate	Fibre or Husk	Ash or Mineral Matter	Water
Acorn, shelled	8·0	2·9	60·9	9·7	1·5	17·0
Alfalfa meal	14·1	2·4	37·3	27·1	7·1	12·0
Barley and barley meal	10·0	2·3	66·1	4·9	2·7	14·0
Bean and bean meal	25·5	1·6	45·9	9·4	3·1	14·5
Beetroot	1·0	0·1	15·1	1·6	0·7	81·5
Beetroot pulp (pressed)	1·8	0·2	18·2	6·4	3·4	70·0
Biscuit meal	13·9	0·7	74·6	0·3	1·1	9·4
Blood meal	81·0	0·8	1·5	—	2·7	14·0
Bones, raw (cut green bone)	20·3	11·7	—	—	29·1	38·9
Bones, meal (bone flour)	28·4	3·5	—	—	60·0	8·1
Bran, wheat (coarse)	13·6	3·4	54·9	8·9	5·6	13·6
Bran, wheat (fine)	14·1	4·2	58·2	7·3	4·1	12·1
Brewers' grains (wet)	5·0	0·4	9·4	7·6	1·2	76·4
Brewers' grains (dried)	19·0	7·0	44·3	16·7	4·0	9·0
Buckwheat	9·0	2·5	56·7	15·0	2·8	14·0
Buttermilk (dried)	42·3	11·2	24·3	—	12·2	10·0
Cabbage (outer leaves)	1·6	—	5·0	0·2	2·2	91·0
Cabbage (inner leaves)	1·5	—	7·0	1·3	0·8	89·4
Carrot	1·4	0·2	10·8	1·7	0·9	85·0
Clover, forage	3·5	0·7	8·1	6·3	1·9	79·5
Clover, hay	14·5	2·2	34·6	26·5	6·2	16·0
Clover, meal	13·5	2·9	37·1	24·1	6·0	16·4
Dari	9·6	3·8	71·2	1·9	2·4	11·1
Distillers' grains (barley, dried)	20·1	6·6	48·3	13·7	3·3	8·0
Fish meal	55·6	4·4	2·1	—	24·9	13·0
Gluten meal	30·1	10·6	44·2	4·6	2·0	8·5
Grass, forage	3·4	0·9	14·1	10·8	2·0	68·8
Grass, hay	9·4	2·6	38·8	28·5	5·7	15·0
Hay: *see* Clover, Grass, and Lucerne						
Hempseed	16·3	30·0	15·0	22·0	4·4	12·3
Lettuce	0·7	—	4·0	—	1·0	94·3
Linseed and meal	20·5	37·0	19·6	7·2	3·4	12·3
Lucerne, forage	4·5	0·8	9·2	9·5	2·0	74·0
Lucerne, hay	16·0	2·3	31·8	26·6	6·8	16·5
Maize and maize meal	13·0	3·3	72·5	1·0	1·7	8·5
Maize germ meal	11·5	11·1	58·4	2·8	4·0	12·2
Malt dust or combs	23·0	1·8	38·0	21·8	6·8	8·6
Malt without sprouts (dry)	9·3	1·6	62·6	16·9	2·3	7·3
Mangold-wurzel	1·1	0·1	9·1	0·9	0·8	88·0
Meat-and-bone meal	50·5	10·0	5·0	2·2	23·1	9·2
Meat, horseflesh	21·7	2·6	—	—	1·4	74·3
Meat meal	72·2	10·1	—	2·5	3·6	11·6
Middlings, wheat (fine)	14·6	3·7	61·6	4·7	2·9	12·5
Middlings, wheat (coarse)	14·6	4·0	54·6	9·2	4·8	12·8
Milk, cow	3·9	3·6	4·6	0·3	0·8	86·8
Milk, cow (skim)	3·7	0·8	4·8	—	0·7	90·0
Milk, dried: *see* Buttermilk						
Millet	13·0	5·0	66·5	1·6	2·3	11·6
Oats	12·0	6·0	55·7	9·3	2·7	14·3
Oatmeal	11·5	4·5	52·2	14·5	6·8	10·5
Parsnip	1·6	0·2	10·2	1·0	0·7	86·3
Pea and pea meal	22·4	2·0	52·5	6·4	2·4	14·3
Potato	2·1	0·3	20·6	1·1	0·9	75·0
Rice, hulled	9·1	2·0	74·5	1·1	1·1	12·2
Rye	11·0	1·6	64·0	7·4	1·8	14·2
Soya bean meal (extracted)	44·7	1·5	31·9	5·1	5·5	11·3
Sunflower, seed	13·0	23·6	23·9	28·5	3·0	8·0
Sunflower, decorticated	36·4	11·0	22·9	14·0	6·5	9·2
Sussex-ground oats (stone ground, with a little barley)	11·3	4·7	62·2	8·5	3·6	9·7
Turnip, swede	1·4	0·2	7·1	1·3	0·6	89·4
Turnip, yellow	1·8	0·2	4·6	2·3	0·6	90·5
Turnip, white	1·1	0·1	5·3	0·8	0·7	92·0
Wheat	13·0	2·2	69·6	1·6	1·5	12·1
Whey	1·0	0·3	5·0	—	0·7	93·0
Yeast, brewers' (dried)	45·5	0·9	34·0	2·2	10·0	7·4

supply all the needs of the fowl, provided a variety of food is given. It is present in large quantities in fish meal, meat-and-bone meal, bone meal, and raw bones, while it is also picked up by the birds in earthy particles from the ground when free range is allowed. It is chiefly concerned in the production of healthy blood, the building of bone tissue, and the making of egg shells, although it is found in varying quantity in all the tissues of the body, to all of which a supply of mineral matter in one form or other is essential to the life and health of the individual. Attention has recently been called to the importance of mineral elements in food, and to the fact that the least of these should not be overlooked if we are to have strong, healthy fowls. It is claimed that, owing to depletion of the soil through the frequent growing of large crops, and through the use of soil lacking in some essential minerals, our grain foods are less rich in mineral matter than formerly, and that, in some cases, it is advisable to supply the lack by adding mineral salts to the soft food. In my opinion, this shortage has also been increased by modern methods of milling.

There is also fibre or husk which has no nourishing value, while only very little of it can be digested by poultry. Food rich in fibre is not suitable for fowls, since it retards the digestion of other foodstuffs and uses more energy in digestion. Nevertheless, adult stock may safely have some, if merely because it has a beneficial effect on the intestines.

There is, of course, the question of digestion. From experiments carried out on one of the American Experimental Stations, it has been ascertained that the digestion of poultry resembles that of other farm animals, but that very little fibre can be digested by fowls. Some tables of analysis of poultry foods contain the average amount of the nourishing constituents which can be digested; but, since, except in comparatively few cases—chiefly in peas, beans, lentils, and linseed—the percentages differ little from those given in the analysis table (p. 216), I have omitted them, as their inclusion would serve no useful purpose.

Balanced Rations

An American poultry authority once observed, "The best food for fowls is that which contains the most material that a fowl can use to advantage." True enough; and it is with the idea of providing fowls with the most material which can be used to advantage that balanced rations are suggested. It is beneficial to supply well-balanced foods and to proportion them according to the object of feeding, whether for breeding and laying stock or market poultry for meat and fat. When dealing with the diet in this manner, it is necessary to consider only the proteids, carbo-hydrates and fats; that is, a balanced ration for a laying hen is a complete diet containing the correct amount of protein in proportion to the amount of fat and carbo-hydrate to maintain the maximum of egg production with the minimum loss of stamina. And it is important to note in connexion with these rations that there must be a sufficient percentage of fats and carbo-hydrates in the diet to prevent any wastage of proteids to supply that deficiency. It has been said that a narrow or a medium ration should be given to layers or breeders, while a wide ration will serve better if fattening or heat producing (as in cold weather) is the object.

Because a considerable variation of the balanced rations (as much as 1 : 5 to 1 : 14) has been found beneficial when dealing with the feeding of farm stock —for whom this method of feeding was first adopted— some people appear to imagine that there should be as wide a range in the feeding of poultry. Nevertheless, this is not so; and experiments with fowls over an extended period have proved conclusively to me that a wider ration than 1 : 10 is very liable to lead to starvation. On the other hand, a ration of 1 : 3 has been suggested for layers, although narrow, while 1 : 5 to 1 : 6 is said to be the medium, and 1 : 9 wide. As a matter of fact, rations which have fluctuated from 1 : 3 to 1 : 9 with an average of about 1 : 6, have produced results which have proved most satisfactory. However, an average nutrient ration of 1 : 4 to 1 : 5 is about right for laying hens, while one of 1 : 7 will maintain a fowl in good health.

Although no one grain or meal is of itself properly balanced for the purpose, and mixtures are advisable, it is not absolutely essential to provide elaborate mashes with a multitude of ingredients to obtain the desired end. Neither is it necessary or desirable to go deeply into the matter. A balanced ration simply means one in which there is a certain relative proportion between the nitrogenous and non-nitrogenous constituents of the food supplied. It will be understood that a ration balanced for birds on free range would not be a balanced ration for birds kept on the intensive system. The most simple method of narrowing or widening the ration is to add to it or take from it a quantity of meat or animal food; animal food is very rich in protein, has no carbo-hydrate and little fat.

When working out the ratio of any given food to find what proportion the proteids bear to the carbo-hydrates (including fats), it is necessary to multiply the fats by 2·29—as their value of carbo-hydrates— add them to the carbo-hydrates, and divide the total of the combination by the amount of the proteids. As an example, take barley, with 10 per cent protein, 66·1 per cent carbo-hydrate, and 2·3 per cent fat.

The fat, multiplied by 2·29, equals, roughly, 5·2. Add this to the carbo-hydrates, and the total is 71·3. Divide by 10 (proteids), and the result is, near enough, 7. Thus, the ratio of barley is 1 : 7, or thereabouts. However, it is necessary to take into consideration the whole of the daily food, viz. mash, grain, and greens, although the last-named can scarcely be included when fowls are at free range, simply because no one kind of green food would be eaten by them. Moreover, birds which are constantly ranging find tit-bits of insect life as well as green food. This is a point frequently overlooked. I have known small poultry-keepers, whose fowls are on the intensive system, to attempt almost to omit the protein part of the mash in the spring months, because they have read that layers find plenty of worms and insects at that season, forgetting that such items are certainly not found in the litter of the intensive house. The intensivist must supply his birds with all the food they get, because they have not the opportunity of finding tit-bits. Hence, when arranging the diet in such circumstances, it is very necessary to bear in mind that what fowls cannot find for themselves must be supplied to them.

The chemistry of poultry foods is meant to be a guide to the interested poultry-keeper; but let the figures in the analysis table act as a guide only. There is often a danger, especially with the beginner, of trying to work too closely to figures without keeping both eyes on the birds, as it were. The great thing is to have some knowledge of the "reason why" of feeding and to feed the birds for results as economically as possible. Now, let me take two plain rations to see how they compare as regards the protein ratio. For summer feeding, the daily ration can consist of mash, composed of equal parts by weight of Sussex-ground oats, bran, and fine middlings, and the grain of wheat and oats. According to the analysis table just mentioned, these work out as follows—

SUMMER DIET

Food	Protein	Carbo-hydrate	Fat
Sussex-ground oats . .	11·3	62·2	4·7
Bran, coarse . . .	13·6	54·9	3·4
Middlings, fine . .	14·6	61·6	3·7
Wheat . . .	13·0	69·6	2·2
Oats	12·0	55·7	6·0
	64·5	304·0	20·0 × 2·29
Add fats equal to carbo-hydrates .		45·8	= 45·8
Total of carbo-hydrates . . .		349·8	

Divide by the total of proteids (64·5) and the ratio is 1 : $5\frac{3}{8}$ (slightly over).

Such a diet as this would be suitable for fowls which enjoy free range in spring and summer, when, unless the weather in the latter season were so hot that the ground was parched, worms and fresh vegetation would be available. The natural animal matter thus obtained might lead one to imagine that a wide ratio, rather than a medium one, should be adopted; but this is not so in practice. On the other hand, because little, if any, animal or vegetable matter would be found on free range during the greater part of winter, and, in addition to this, the pullets would be more or less confined to their laying quarters; it would be well-nigh essential to use in their diet something to take the place of the herbage, etc., they would undoubtedly get at other times. The diet, therefore, might well include clover meal and fish meal. It could then be as follows—

WINTER DIET

Food (all parts by weight)	Protein	Carbo-hydrate	Fat
1 part Sussex-ground oats	11·3	62·2	4·7
1 ,, Barley meal . .	10·0	66·1	2·3
1 ,, Maize meal . .	13·0	72·5	3·3
2 parts Bran . . .	27·2	109·8	6·8
3 ,, Middlings . .	43·8	184·8	11·1
1 part Clover meal . .	13·5	37·1	2·9
½ ,, Fish meal . .	27·8	1·05	2·2
2 parts Wheat . . .	26·0	139·2	4·4
1 part Maize . . .	13·0	72·5	3·3
	185·6	745·25	41·0 × 2·29 = 93·89
Add fats equal to carbo-hydrates .		93.89	
Total of carbo-hydrates . .		839·14	

Divide by the total of proteids (185·6), and the ratio is 1 : $4\frac{1}{2}$ (just over).

It is hardly possible to obtain the analysis of the natural animal and vegetable foods which fowls secure when they are at free range, or, indeed, to ascertain the quantity of such items they pick up; but in comparing the summer and the winter diets, it will be seen that, while both of them are practically in the medium nutrient-ratio class, there is a difference between them as regards that ratio. It is held by some authorities that more carbo-hydrates, more heat-producing elements, are required by layers in winter than in summer, and that the diet for the cold weather should not be as narrow as that for other seasons; but this is not the case.

Rations at Laying Tests Tabulated

As an indication of what constitutes balanced rations, I cannot do better than mention those which are used in connexion with some of the well-known

laying trials held annually in England. Take the tests which are in vogue year after year at Harper Adams Agricultural College, Newport, Shropshire, as they are among the most important in this country. The food is divided into summer rations (April to September) and winter rations (October to March), and consists of grain and wet mash.

HARPER ADAMS COLLEGE LAYING TEST
SUMMER RATIONS

WET MASH	PROTEIN	CARBO-HYDRATE	FAT
2 parts Sussex-ground oats	22·6	124·4	9·4
2 ,, Maize meal . .	26·0	145·0	6·6
6 ,, Sharps . . .	87·6	369·6	22·2
1¼ ,, Bran . . .	17·0	68·6	4·2
1¼ ,, Alfalfa meal . .	17·6	46·6	3·0
1¼ ,, Fish meal . .	69·5	2·6	5·5
GRAIN			
2 parts Wheat . . .	26·0	139·2	4·4
1 part Clipped oats . .	12·0	55·7	6·0
1 ,, Kibbled maize .	13·0	72·5	3·3
1/16 ,, Cracked peas .	1·4	3·3	0·13
	292·7	1027·5	64·73 × 2·29 = 148·23
Add fats equal to carbo-hydrates .		148·23	
Total of carbo-hydrates . .		1175·73	

Ratio 1 : 4 (slightly over)

Note. In this ration, 0·5 per cent of cod-liver oil is added to the wet mash; and the parts of the mash are taken by dry weight, that is, prior to the meals, etc., being prepared with water.

WINTER RATIONS

WET MASH	PROTEIN	CARBO-HYDRATE	FAT
1 part Sussex-ground oats .	11·3	62·2	4·7
1 ,, Maize meal . .	13·0	72·5	3·3
½ ,, Bran . . .	6·8	27·45	1·7
2 parts Sharps . . .	29·2	123·2	7·4
½ part Alfalfa meal . .	7·05	18·65	1·2
½ ,, Fish meal . .	27·8	1·05	2·2
GRAIN			
2 parts Wheat . . .	26·0	139·2	4·4
1 part Clipped oats . .	12·0	55·7	6·0
1 ,, Kibbled maize .	13·0	72·5	3·3
1/16 ,, Cracked peas .	1·4	3·3	0·13
	147·55	575·75	34·33 × 2·29 = 78·6157
Add fats equal to carbo-hydrates .		78·61	
Total of carbo-hydrates . .		654·36	

Ratio 1 : 4½ (under)

Note. The above ration includes, in addition to the foodstuffs mentioned above, 1 per cent of cod-liver oil and 2 per cent of dried yeast in the wet mash, and 0·5 per cent of cod-liver oil in the grain. At these laying trials, the pullets which are competing are kept in enclosed grass runs; hence, while herbage would be available during normal seasons, there would be little opportunity of the birds getting worms and other

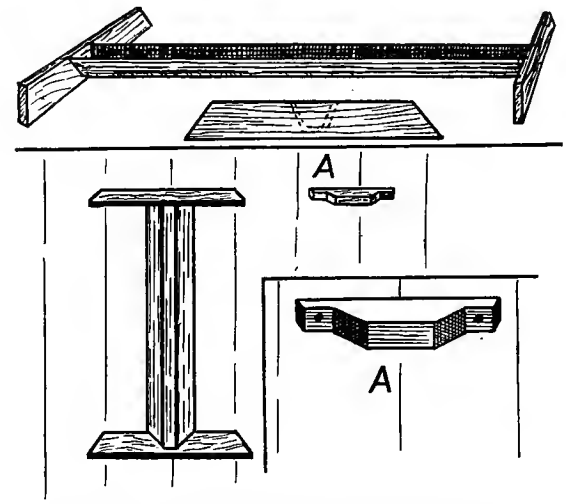


FIG. 140. THE WET MASH TROUGH

Wet mash troughs for layers should be long and narrow, V-shaped, or as shown by the dotted lines above. When not in use they should he hung in a convenient place, such as the wall of the fowl house by means of pieces of shaped wood (*A*) screwed on, 4 ft. to 5 ft. up.

natural animal food. During summer (April to September) the pullets are provided with two meals *per diem*. Grain is given to them in the morning, about 2 oz. of it a head; and it is scattered broadcast in the grass runs, or, if the weather is wet, inside the houses, among the straw, for scratching purposes. In the afternoon, they get about 2 oz. each of dry meals, etc., mixed into a wet mash and put into troughs in the outside runs. Throughout winter (October to March) three meals *per diem* are allowed. Breakfast consists of about 1 oz. a head of grain, either in the house litter or outside (in the grass runs) according to the weather. The second meal (around midday) is wet mash, the quantity averaging about 1½ oz. of dry meals, etc., for each bird, the mash being prepared with "lukewarm water into a nice pliable condition." It is, of course, put into troughs. The third meal of the day (in winter) is about 1 oz. of grain and ½ oz. of mash for every pullet, the food being given inside the houses or in the outside runs, according to the state of the weather. In the Harper Adams rations, it will be observed that cod-liver oil and dried yeast are used.

On the other hand, at the biggest laying test in the world, viz. the National, held at Milford, Surrey —where over 3500 birds compete—which is run on business lines, that is, with the object of getting the best possible results from what is termed commercial dieting, the whole of the foods used are such as constitute plain rations, those which any poultry-keeper can adopt without worrying about percentages. From particulars of the feeding at these Tests which have appeared from time to time, I have compiled the following table—

THE NATIONAL LAYING TEST RATIONS

	1933		1934				
DRY MASH	Oct.	Nov. and Dec.	Jan.	Feb., Mar., Apl.	May	June and July	Aug. and Sept.
Weatings (middlings)	40	40	40	45	48	48	50
Bran	20	20	20	22	22	20	20
Sussex-ground oats	12	10	12	—	—	—	—
Maize meal	14	20	20	20	18	20	20
Alfalfa meal	5	—	—	5	5	5	3
Fish meal	7	10	8	8	7	7	7
Pea meal	2	—	—	—	—	—	—
GRAIN							
Wheat	2	2	2	2	2	2	2
Clipped oats	1	1	1	1	1	1	1
Cracked maize	1	2	2	1	1	1	1

Notes. All figures represent those of weight, in pounds avoirdupois. These diets work out at from 1 : 4 (slightly under) for winter to 1 : 5⅓ (just over) for summer. Oyster shell (crushed) and flint grit are always available. The dry mash hoppers are open at all times, subject to control when, and as, desired. In winter, early in the morning, about 1 oz. of grain a head is scattered over the litter in the house, to promote exercise; and in the afternoon, just before dusk, a full meal of grain is given from troughs. In summer, one meal of grain is allowed, and it is thrown broadcast over the grass runs. The fowls are kept in small lots, semi-intensively, on grassland.

In connexion with the National Laying Test an alteration was made in the feeding arrangements for the 1936–37 season, during the winter months at any rate. Dry mash was entirely omitted—except for single birds—the pens getting three set meals *per diem*. Breakfast consisted of ½ oz. a head of mixed grain among the litter; at 11 a.m. the fowls had 1½ oz. of wet mash, and then about 2.30 p.m. they were allowed to eat freely of grain. This last meal of the day was put into troughs, and they ate as much as they liked. The results have to be seen, but the authorities considered it quite a logical system.

THE WYE AGRICULTURAL COLLEGE (KENT) TRIALS

At these laying tests, the birds get the following diets—

MASH	SUMMER	WINTER
Middlings	45 parts by weight	40 parts by weight
Bran	15 ,, ,,	15 ,, ,,
Sussex-ground oats	13 ,, ,,	13 ,, ,,
Maize meal	17 ,, ,,	22 ,, ,,
Meat-and-bone meal	10 ,, ,,	—
Fish meal	—	10 ,, ,,
GRAIN		
Wheat	1 part ,,	2 ,, ,,
Kibbled maize	1 ,, ,,	3 ,, ,,

Summer ratio 1 : 3⅓ (just under)
Winter ratio 1 : 4 (about)

THE SURREY COUNTY TRIALS

At this test, held at Milford, but altogether distinct from the National Laying Test, the birds are fed on grain and wet and dry mashes, wet mash being the first meal of the day. The rations provided during the trials are generally as follows, but are slightly altered from time to time to suit prevailing weather or pasture conditions—

WET AND DRY MASHES

Maize meal	2 parts by weight
Sussex-ground oats	½ part ,,
Middlings	9 parts ,,
Bran	2 ,, ,,
Alfalfa meal	½ part ,,
Dried skim milk	½ ,, ,,
Meat-and-bone meal	2 parts ,,
Fish meal	½ part ,,
Salt: 8 oz. per 100 lb. mash.	

GRAIN

Equal parts by weight of wheat, oats, and kibbled maize.
1 per cent of cod-liver oil was added to the grain.
Ratio 1 : 3½ (slightly under).

Notes. Cockle shell and smooth flint grit are always before the birds. These trials, in Surrey, are regarded, primarily, as a test of potential breeding stock, and not in any sense as a laying competition.

MINISTRY OF AGRICULTURE

Yet another ration is that advocated by the Ministry of Agriculture, and known as the Laying Trials Ration, for use all through the year. It consists of the following—

MASH	
Maize meal	4½ parts by weight
Sussex-ground oats	2 ,, ,,
Straight-run bran	3 ,, ,,
Straight-run middlings	8 ,, ,,
Fish meal	2½ ,, ,,
GRAIN	
Wheat	3 ,, ,,
Kibbled maize	2 ,, ,,

This works out at a ratio of slightly over 1 : 3¾.

It will thus be seen that the nutrient ratios of these Laying Test rations vary between the narrow and the medium classes, as they range from just over 1 in 3 to slightly over 1 in 5⅓. At such trials, the birds do not enjoy free range, hence they have to be supplied with animal protein (fish meal or meat-and-bone meal) all through the year. The grain mixture used in these trials could be given with safety to ranging fowls, but, generally, the mash in some of them might be somewhat narrow for such birds.

Other Suitable Rations

However, weather conditions must be taken into consideration, even when fowls are allowed to roam over a wide area; and during the summer of 1934 I found it necessary to add meat meal to the rations, and to continue with kibbled maize in the grain mixture. One of the rations used, and which gave very satisfactory results, consisted of the following—

MASH	
Best middlings	3 parts by weight
Broad bran	2 ,, ,,
Sussex-ground oats	1 part ,,
Maize meal	1 ,, ,,
Meat meal	½ ,, ,,
GRAIN	
Wheat	1 ,, ,,
Kibbled maize	1 ,, ,,
Clipped oats	1 ,, ,,

This worked out at 1 : 4¼ (just over).

Very little dry mash was supplied to the birds after early spring, all mash being wet and prepared with boiling water at least twelve hours before it was put into the troughs.

When very small or "chat" potatoes are plentiful (and can be purchased at 3s. per cwt.) I never hesitate to use them in the mash for laying hens, twice or thrice a week during winter and spring. In this case, the diet is composed of grain and wet mash.

POTATO MASH	
Barley meal	1 part by weight
Bran	1 ,, ,,
Middlings	1 ,, ,,
Fish meal	1 ,, ,,
Potatoes	6 parts ,,
GRAIN	
Kibbled maize	2 ,, ,,
Wheat	1 part ,, ,,
Clipped oats	1 ,, ,,

Ratio 1 : 4.

The potatoes are weighed raw. They are roughly washed to free them from earth, then gently boiled in their skins until they break easily, drained, turned into the mash tub, and broken down quickly; 4 oz. of liquid fat are added to the gallon, and the meals, etc., are worked in while the mash is hot. My attention was drawn to the value of potatoes in the laying mash by reading of experiments which had been carried out at the Experimental Station at New Brunswick, from 1st December to 31st May in three successive years, when they gave most satisfactory results, and "egg production was higher than with ordinary meals." In those experiments, the grain was similar to the mixture mentioned above, but the moist mash contained ground oats and no fish meal or any other animal protein. It worked out at a ratio of 1 : 6, but I find a narrow ratio (with barley meal and fish meal) more suitable for my purpose.

Another ration which includes potatoes, but with a narrower ratio still, was sent to me some time ago as being suitable for intensively kept fowls, and solely for egg production. It is as follows—

POTATO MASH	
Sussex-ground oats	2 parts by weight
Middlings	1 part ,,
Bran	1 ,, ,,
Fish meal	1 ,, ,,
Potatoes	4 parts ,,
Soya bean meal	½ part ,,
Dried yeast	½ ,, ,,
GRAIN	
Wheat	2 parts,, ,,
Kibbled maize	1 part ,,
Clipped oats	1 ,, ,,

Ratio 1 : 3 (over).

When giving potato mash to my fowls it forms their breakfast and afternoon meals, and the grain is thrown down for them at midday.

As it is always beneficial to have alternate diets, two more are suggested; and since the vast majority of poultry-keepers in a small way prefer to mix the ingredients of the wet mash by strike measure, because suitable scales are not always handy, the parts are

by measure and not by weight. Both of these diets are suitable for layers which are kept where little, if any, grassland is available, that is, in back garden runs; but fresh green food must be given daily, at most seasons.

Mash	Summer	Winter
Sussex-ground oats	3 parts	4 parts
Maize meal	2 ,,	4 ,,
Bran	5 ,,	2 ,,
Middlings	5 ,,	6 ,,
Alfalfa meal	——	1 part
Meat-and-bone meal	1 part	——
Fish meal	1 ,,	1 part
Milk powder	——	½ ,,
Grain		
Wheat	1 part	2 parts
Clipped oats	1 ,,	——
Kibbled maize	1 ,,	1 part

I have said that, when balancing a ration, it is not essential to provide elaborate mashes with a multitude of ingredients to obtain the desired end. On the other hand, there are feeders who appear to imagine that unless there is plenty of variety, some necessary element might be omitted, while they balance the diet to a very narrow ratio with the idea of getting the utmost possible production from their birds in the first laying year, regardless of subsequent results. With this object in view, a poultry-keeper whose pullets are kept in confined runs recently informed me that his birds are fed all through their first season of laying on the following diet—

Dry Mash (available at all times of the day)	
Middlings	28 lb.
Bran	22 lb.
Wheat germ	5 lb.
Maize meal	15 lb.
Barley meal	2 lb.
Ground oats	3 lb.
Alfalfa meal	4 lb.
Powdered milk	5 lb.
Blood meal	5 lb.
Meat meal	5 lb.
Bone meal	1 lb.
Ground oyster shell	2½ lb.
Common salt	½ lb.
Charcoal	1 lb.
Cod-liver oil	1 lb. = 1 pint
Grain	
Kibbled maize	60 lb.
Wheat	20 lb.
Pearled barley	10 lb.
Whole groats	10 lb.

The grain, being small, is given as what in America is known as "scratch feed," that is, when scattered broadcast over the house litter much of it disappears from sight; hence the birds must exercise to a considerable extent to obtain it. Omitting the cod-liver oil, shells, salt, and charcoal, the dry mash represents a ratio of 1 : 2·6 (about). As can be seen, this is a very narrow one, while, when the grain is added, the ratio is still well below 1 : 3. So, although I should hesitate to employ such a diet, even for heavy egg production, the dry mash might be serviceable for layers which are kept on the single battery system.

Yet another mash and grain ration, recommended by the National Institute of Poultry Husbandry, for layers, is as follows—

Dry Mash	
Maize meal	22½ parts by weight
Sussex-ground oats	10 ,, ,,
Meat-and-bone meal (*or* Fish meal)	12½ ,, ,,
Middlings	40 ,, ,,
Bran	15 ,, ,,
Grain	
Wheat	3 ,, ,,
Kibbled maize	2 ,, ,,

Dry mash and oyster shell or limestone grit are always available, while the grain allowance is approximately 2 oz. a head *per diem*.

All Dry Mash Rations

With the exception of the diet mentioned in a preceding paragraph—dry mash containing fifteen different ingredients and a mixture of four kinds of grain—the whole of the others are suitable for layers in varying circumstances, that is, for fowls which have soft as well as hard (grain) food. In addition to them there is the all dry mash system of feeding layers, which is adopted by some commercial poultry-farmers whose young stock has been brought along without grain, this latter being entirely excluded from the diet. In such circumstances, two mixtures are recommended. The first is as follows—

Maize meal	30 parts by weight
Soya bean meal	5 ,, ,,
Middlings	40 ,, ,,
Bran	20 ,, ,,
Fish meal	5 ,, ,,
Dried skim milk	5 ,, ,,
Salt	1 part ,,
Cod-liver oil	1 ,, ,,

Plus 5 lb. fresh green food per 100 birds daily.

Omitting salt, cod-liver oil, and green food, the ratio is 1 : 3⅜ (about). This ration is recommended solely for layers which are kept on the intensive system. The dry mash is before the birds all day, and oyster shell or limestone grit is always available.

The other mixture for the all mash system, and recommended by the National Institute of Poultry Husbandry, for laying pullets which have been reared and grown on the intensive system, and brought along solely on dry mash (i.e. no grain), is as follows—

Maize meal	50 parts by weight
Bran	10 ,, ,,
Middlings	21 ,, ,,
Sussex-ground oats	10 ,, ,,
Meat-and-bone meal (*or* Fish meal)	7½ ,, ,,
Salt	½ part ,,
Cod-liver oil	1 ,, ,,

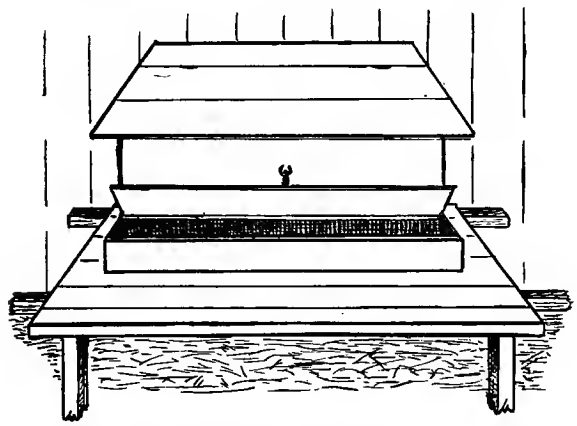


FIG. 141. THE DRY MASH HOPPER

Since fowls waste food when eating dry mash, some getting spilled or hooked out, it is a good plan to put the hopper on a platform. The waste can then be removed, instead of being allowed to mix with the floor litter and thus encourage mice or rats

Oyster shell or limestone grit should be given in a separate hopper, and should always be available.

Other Methods

So far, I have dealt with the feeding of layers on the grain and mash systems. Another method, which has come much into vogue of recent years, is that in which poultry-nuts replace mash, either wet or dry. The introduction of this form of poultry food into England by the British Oil and Cake Mills (Hull) was a sequel to its use in that great egg-producing country, Holland. A mash containing the usual ingredients (such as Sussex-ground oats, maize meal, soya bean meal, meat meal, bran, middlings, and mineral salts) is mixed wet, cooked by steam heat, and then transferred to the nutting machine, where the food is subjected to great pressure and forced through holes of the appropriate size, to be cut off into the form of very hard nuts, which readily retain their compressed shape, free from meal or waste. These poultry-nuts (Robson's) have the following guaranteed analysis—

Protein	18%
Carbo-hydrate	53%
Oil	3%
Fibre	7%

so that, together with the usual grain ration, they provide the necessary proteids and carbo-hydrates in the correct proportion for heavy egg production. They are ready for immediate consumption and are just as quickly consumed as wet mash; and since they are cooked, they are more easily digested than mash. They can be given in dry mash hoppers; and, each nut being a perfectly balanced particle of egg-forming food, the birds cannot possibly pick out, and eat to excess, the ingredient they may like best.

Earlier in this chapter, I have given two plain rations which have been found suitable for layers which are kept on free range. Many poultry-keepers, however, have to restrict their fowls to small runs. Hence, for such birds, the following mixtures will be found beneficial—

DRY MASH	SUMMER	WINTER
Sussex-ground oats	14 parts by weight	7 parts by weight
Maize meal	14 ,, ,,	14 ,, ,,
Barley meal	7 ,, ,,	14 ,, ,,
Weatings (middlings, etc.)	35 ,, ,,	42 ,, ,,
Bran	28 ,, ,,	21 ,, ,,
Alfalfa meal	7 ,, ,,	7 ,, ,,
White fish meal	7 ,, ,,	7 ,, ,,
Cod-liver oil	—	1 part ,,
GRAIN		
Wheat	1 part by weight	3 parts by weight.
Clipped oats	1 ,, ,,	— ,, ,,
Kibbled maize	— ,, ,,	2 ,, ,,

Summer ratio 1 : 4 (about); Winter ratio 1 : 4½ (about)

WET MASH	WINTER
Maize meal	21 parts by weight
Barley meal	14 ,, ,,
Sussex-ground oats	14 ,, ,,
Weatings	35 ,, ,,
Bran	14 ,, ,,
Alfalfa meal	7 ,, ,,
Meat-and-bone meal	7 ,, ,,
Cod-liver oil	1 part ,,

This wet mash, combined with the winter grain mixture (three parts of wheat with two parts of kibbled maize), works out at a ratio of practically 1 : 4⅔.

Most of the foregoing rations, as I have shown, are properly balanced to suit the fowl's digestion. However, when feeding poultry, environment and general conditions have to be taken into consideration; and the best possible guide as to the suitability or otherwise of a diet is the health of the birds and what they are doing. The amateur might well study the analysis

table; but he should also learn what certain foods are for, and train his observation to note that certain signs show the need for some addition to, or alteration in, the food.

Notes on Foodstuffs

I have dealt with diets, and given sufficient formulae to enable the feeder of laying stock to select suitable wet and dry mashes and grain mixtures with which to begin his experiments. In the selection of foods, that it enables the birds to pick out what they fancy and leave the rest; but this will not be the case if the layers are properly fed, and granted, of course, that the grain is sound. As a matter of fact, no grain is properly balanced; hence the benefit of mixtures. The object of using meals in the diet is because any ground grain is more quickly and easily digested; and if a layer is to provide five eggs a week, it will be readily understood that not only must she have food which will not overtax her digestion, but also food

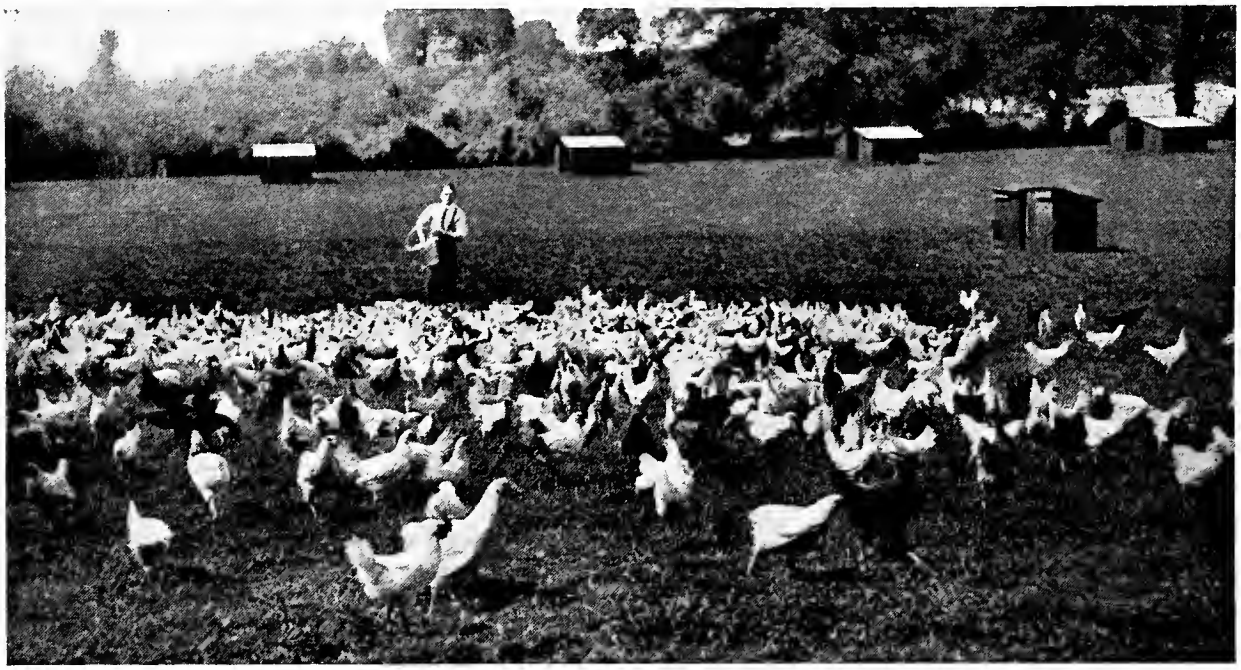


FIG. 142. FEEDING FOWLS

Ready for the grain ration. Fowls which enjoy a wide range and are housed on the colony system, generally exercise within easy distance of their night quarters, each colony more or less keeping to itself. Even though they may be fed near their own houses, however, the appearance of the man with the food bucket almost invariably causes them to congregate, and until a few handfuls of corn have been scattered, they do not separate to seek their own feeding patches

it is as well for the poultry-keeper to acquire a little knowledge of those meals, grains, etc., which are in common use; so I will now deal briefly with such as are easily within his reach at a moderate cost and can be purchased from a country corn-chandler. In purveying for fowls, their food can be divided into three distinct sections, viz. cereals (grains and the meals therefrom), vegetables, and animal matter.

Grain forms a good part of the poultry diet at all seasons, and when sound there cannot be anything better. The giving of grain only, an all grain diet, is generally beneficial for pullets which are being grown for stock, rather than early production, as well as for those birds which, being early hatched, are required for late autumn laying. Some poultry-keepers do not give their fowls mixed grain, because they imagine which will be quickly used up for daily body maintenance and those eggs.

Authorities contend—and their contentions are based on experiments—that ground grain is, in some cases, up to 20 per cent more economical than whole grain; but this economy is simply on account of the birds being able to convert this raw material into eggs quicker and with less strain. It has been asserted that there is more nourishment in meal than in grain; but this is not so, since there is little, if any, difference between the component parts of whole and ground grain, i.e. meal made from it. Nevertheless, while fowls are able to convert meal into eggs with less energy, and it is beneficial to aid them to assimilate their food, it is most unwise to provide them solely with wet mash with the idea of getting the maximum of eggs. For this reason, therefore, I find it advisable

to give layers at least one meal of grain *per diem*; but during the twenty-four hours, one meal of wet mash will be ample. Of course, the fowl has its own "mill," the gizzard, while its gastric juices are not great, and the digestive functions are not adopted for prolonged digestion. However, it is a mistake to deprive the organs of their natural work, even when the poultry-keeper is anxious to get the maximum of eggs.

Fowls should be provided with some form of green food daily, and, whenever possible, in a live state, if only because it then contains the vitamins. The heating, ageing, and drying of foods has a harmful effect upon some of the vitamins, but does not affect the vegetable salts, which term refers to vitamins and not to salts. Nearly all kinds of edible green-stuffs, especially when young and tender, contain salts, which act as a gentle stimulant to the liver; they also tone and correct the internal organs. Moreover, fresh vegetables prevent overfeeding and many so-called liver troubles. If provided in the morning, when the birds are not ravenously hungry, the quantity may be left to them, as they would then not be likely to gorge themselves with any one kind of food.

Free-range fowls devour worms, snails, flies, beetles, grasshoppers, crickets, every kind of grub, and other creatures which come within their range; but if much natural meat is supplied to hens in small runs they become over-fat, and cease laying. Worms should be withheld from the diet of fowls intended for table purposes, because they more or less deteriorate the fine flavour of the flesh. Hens are partial to shell snails; but snails are still more fattening than worms. Too many, therefore, should not be given to layers. On the other hand they do not have a detrimental effect on the flavour of the flesh.

Different Kinds of Grain

Although the corn ration for layers is generally confined to maize, oats, and wheat, there are other grains which can be included in the diet; and these are barley, beans, buckwheat, dari, hemp, linseed, millet, peas, rice, rye, and sunflower.

Barley is a useful cereal; it has a very fair percentage of protein, but it does not rank as high as wheat in digestible protein, although its fat tends to increase the proportion of the yolk. Some years ago, it was one of the staple foods of poultry; but when given at all extensively, I find that it has a great tendency to create enlarged and fatty liver. On account of its beard and rough husk, fowls seldom eat it with eagerness at first, although when hulled, provided the grain is of good quality, it can be given sparingly in a mixture, particularly during winter. In this direction, a mixture of three parts clipped oats, two parts small wheat, one part cracked or kibbled maize, and half a part English barley (hulled), all parts by weight, will be found useful, if it be balanced with a fairly wide mash ratio.

Beans (and peas) are rich in protein, but contain comparatively little fat and mineral matter. They are useful to combine with animal protein, but require the addition of minerals when included in a diet in such a way. If given as part of the grain ration—they can replace maize during the autumn—they should always be well split or kibbled; and, even then, I find they are better relished by fowls after the beans or peas have been softened by gentle boiling. I use them only when they are plentiful and cheap.

The best buckwheat for fowls is the French, which is small, has a thin skin, and is full of meal rich in oil, making it an easily digested grain. It helps to enrich the blood; but must be used with discretion. Fowls do not eat it readily; in fact, until they are accustomed to buckwheat, they are likely to ignore it completely. It should be mixed with other grain in a trough or thrown on a bare patch of ground to begin with, simply on account of its colour. The grain is so nearly the colour of the ground that, if scattered on loose earth, it will probably be missed by the birds, although properly fed fowls—those which always come up to the scratch at meal times—rarely overlook the least little bit in the way of food.

Dari, or dura, like sorghum seed, belongs to the great millet family, and is known also as dhari, Indian millet, Kaffir corn, Guinea corn, and by other names. It is useful to give variety in feeding; but although, a few years ago, attempts were made to prove that its feeding value was equal to wheat—some samples of dari are close to wheat in composition—like all grains grown in tropical climes, the protein matter is harsh and requires far more energy to digest than the softer protein of wheat grown in a colder and more humid atmosphere. Thus the full value of the grain cannot be absorbed by fowls. Dari does not contain as large a percentage of protein as maize, oats, or wheat; but it is a good grain to use in a mixture, particularly in summer, when the layers do not require such heavy feeding. One part of it, with two parts of wheat and three parts of clipped oats, by weight, will be found useful, if the dari is clean and sound.

Hempseed and linseed contain a very large percentage of fat, but the former seed is also very bulky. It is useful to include in the diet of old hens which are going off lay, as it acts as a stimulant, but it has little feeding value. On the other hand, boiled linseed —boiled to a jelly—used as about 5 per cent of the mash twice a week in the diet of the breeding stock, is said to be beneficial, while for chickens which are backward in feathering, and fowls which are moulting,

boiled whole linseed, combined with flowers of sulphur and salt, is a good tonic.

Maize

Maize is a very valuable grain for poultry, despite its fattening nature, as it is highly digestible, contains little fibre, and is free from husk. Not only does it deepen the colour of the yolk, but it provides the fowl with the very element of which the yolk is almost entirely composed. Admittedly, it is still blamed for most of the poultry troubles caused by mismanagement and lack of observation. Experienced feeders will agree that it is one of the most useful grains we have for adjusting the food for certain conditions. Those interested in vitamins will perhaps value maize more than others, because it is the only grain which contains the two essential vitamins in useful quantity. I find that it is more beneficial for winter than summer feeding, while it is better for fowls which enjoy free range than those confined to small runs; that is, although ranging birds may have as much as 50 per cent, those kept in a back-garden should never receive more than about 30 per cent.

It is only necessary for the small poultry-keeper to remember that maize is a heating and fattening grain; if this be kept in mind, there will not be much fear of beginners giving an excess when little should be used, or leaving it out of the diet when a proportion would be beneficial. No matter whether the flat or the round corn is chosen, it must not be given whole, simply because in such a state it is difficult to masticate in the crop and the gizzard. Maize should always be broken, cracked, or kibbled. Not only is this necessary because a broken grain is more easily digested than the whole, but in order that the birds will have to take more exercise to find the pieces.

It is said that the red, or, rather, red-brown variety is superior to the yellow-coloured corn, but this does not appear to matter for layers, as long as the maize is sound. One thing to note, however, is that, while the yellow varieties are beneficial for layers, helping considerably in improving the colour and richness of the yolk of eggs, only the white varieties should be used in fattening mashes, particularly when yellow-skinned birds are being prepared for table. Yellow maize adds colour to the fat, which is not a good point in English table fowls, however much it may be esteemed in America.

It is not advisable to give layers much maize in hot weather, especially in combination with potatoes; but where fowls have ample scratching exercise, and their diet is properly balanced, there is no harm in using up to 10 per cent in summer and up to 25 to 30 per cent in winter. When it is given to this latter extent in the grain ration, there is no need to add maize meal to the mash. It is common, nowadays, to use what are known as maize grits, or the hard, yellow portion of the grain broken and graded into various sizes for chickens, growers, and adult stock. Poultry-keepers using this form of maize should know that the germ has been removed; hence the grits have not quite the same value as the whole grain, broken or kibbled.

Millet is very similar in value to some varieties of wheat and is very digestible. Being particularly small, it will be found useful to include in "scratch feed," hence it is of value, with other grains, for layers kept on the intensive system.

Oats, Rice and Rye

Oats make an interesting subject for the poultry-keeper to study, and I question if there is any grain with which care in selection is so essential. If they are to be of true economical value, they must be of the best. The novice may be attracted by size, and use a sample which is quite unfit for poultry, because of the tough, thick husk which is generally found on the largest grain. A short, plump oat, with a very thin skin, is the ideal; and when such oats are clipped, it is not uncommon for them to weigh up to 48 lb. or even 50 lb. per bushel. If poultry-keepers will remember that 1½ oz. of such grain contains far more actual food for the birds than 2 oz. or more of light, thin oats, and if they will also remember that the more the percentage of husk, the more work the digestive organs will have, they will not seek the lowest-priced oats for their fowls, but rather look for the best, even though they will be higher priced. I have seen a large amount of waste in light oats, scaling 40 lb. to the bushel, for instance, which means that those using them really pay more than they would do if they bought the heavier and, apparently, more expensive oats. Although the husk of the oat is usually much thicker and less digestible than the husk of other grain, the oat is rich in protein and also in fats, the latter being the great factor in assisting the digestion of the grain. Oats stripped of their husk are known as groats, which, when cut, are called coarse oatmeal, which is used for porridge.

Rice is highly digestible and rich in carbo-hydrates; but while it is reckoned among the available grains for poultry, its greatest objection is its high starch content. It is seldom good enough unless prepared for household use, in which case it is too expensive for frequent use. Broken rice can sometimes be obtained at a cheap rate; and in this case it should be boiled in skim milk and stood aside until quite cold, when it will be firm enough to be taken out in lumps and easily broken into pieces. In such a state,

however, it should be used in the wet mash rather than thrown down as grain.

Although rye is somewhat similar to wheat in composition, colour, size, and appearance—torrefied rye is often mistaken for wheat—it is not equal in feeding value. It contains rather less carbo-hydrates and protein, but considerably more fibre or husk. I do not advocate it as poultry food, because even the soundest sample of the grain is not relished by fowls. On the other hand, sprouted rye is said to be very palatable, and I am told that it is then beneficial. As grain, however, it is not a success as poultry food.

Sunflower Seed

A recent analysis of decorticated sunflower seed showed the presence of over 90 per cent of total dry matter, which consisted respectively of about 37 per cent of proteids, 11 per cent of fat and almost 23 per cent of soluble carbo-hydrates. The digestible nutrients obtained from this cake were proteids 33 per cent approximately, just over 10 per cent of oil, and nearly 15 per cent of soluble carbo-hydrates. If sunflower seed itself is employed as a poultry food these digestible nutrients are lower; nevertheless, the sunflower is well worthy of culture for feeding. It is the old giant annual sunflower which should be selected, the heads of which may be many inches in diameter. The heads should not be cut until they are as nearly ripe as possible; that is, when seeds begin to drop out if lightly touched with finger or thumb. Keep the heads for a few days in a sunny window, and then shake out the seeds and dry them cautiously but thoroughly on a rack well above the kitchen fire, after which store them in tins until required. Some poultry-keepers give the heads to their fowls as they are cut off, either throwing them into the shed or house, or hanging them 1 ft. from the floor because taking out the seeds affords occupation for the birds for some hours. But it is much better to dry the seeds as suggested above, and give them to the fowls once or twice a week.

Sunflower seed is suitable for layers during winter, but it is too fattening for prolonged or continuous use. It should never be given more than twice a week; and on such days the wet mash could be composed of biscuit meal, bran, middlings and cabbage in equal parts, with one-third of a part of fish meal. Some fowls do not take readily to sunflower seeds; but in such a case—granted the seeds are properly dried and not mouldy, a point that must be watched—a small quantity of it could be mixed with the usual grain and put into a trough for the first two or three times. Otherwise, do not mix it with other grain, but throw it down whole. It should not be ground or prepared in any way.

Wheat

Wheat is one of the most popular grains; and on several occasions I have used it as the sole corn ration for free range fowls, and with considerable success. As a matter of fact, if it were necessary to confine a flock of layers to a single article of diet, wheat would give the best results, that is, provided the birds had their freedom. Confined fowls which are supplied with wheat exclusively might be subject to digestive disorders; hence it is generally given to them along with oats and kibbled maize. However, this grain is of a size, colour, and texture that attract poultry, and it is decidedly palatable. It has a tendency to lighten the colour of the yolks of eggs; but, mixed with maize, or supplied to fowls which have access to grassland and green food, it is a safe grain. A glutinous sample is better than one which is mostly starch, a difference which can be detected by chewing a few kernels, since the former will work up to a doughy mass, while the latter will not. English wheat is soft in character, and, therefore, easily digested; but in conjunction with the carbo-hydrates it is apt to lead to excess of fat, if birds kept in close confinement get too much of it. Canadian and American wheats are exceptionally rich in protein, and harder than the English, while strong Manitoban, a top Canadian grade, is probably the best, although generally too high priced to be given to poultry. Argentine is also a valuable wheat, although rarely obtainable. Australia exports only her white wheat, and although it is harder and in better condition than a great part of our English it is not as rich in protein as those mentioned.

Care should be taken when buying wheat to avoid samples which show signs of having sprouted. Musty, smutty, and heated wheat should also be carefully avoided, no matter how low may be the price of it. There is no objection to millers' screenings (which are composed of the refuse or screenings from the better grades of wheat, and contain broken and shrunken wheat kernels and weed seeds), or to farmers' tailings, the small or tail wheat which is separated before marketing the milling grain. But the difficulty is to find screenings, tailings, and dredge corn which do not contain a quantity of wild mustard, rape, bastard or small buckwheat, linseed, clover seed, wild grass seeds, chaff, and often harmless trash. However, reliable screenings, like dredge corn, are useful to mix with half as much kibbled maize or a quarter of its bulk of well kibbled beans and peas for fowls which are kept on the intensive system, when the grain is buried in the scratching litter. It is a mistake, however, to scatter the screenings on the land, because it almost invariably leads to a crop of weeds.

Acorns

Another "grain," i.e. seed, mentioned in the analysis table is the acorn. Acorns can be used as poultry food; and they may be given to stock birds and those which are being fattened. Layers, however, should not get them, simply because the yolks of eggs laid by hens which eat acorns soon become discoloured, developing a dull bottle-green tint, and sometimes, if the acorns are green and eaten to excess, they turn almost black. On no account should acorns be used when freshly picked, that is, as fresh fruit, otherwise they will considerably upset the digestion of fowls, although they do not appear to have the least detrimental effect on adult turkeys or on wild pheasants. For use as poultry food, acorns should be stored for two or three months, in small heaps in the open, and covered with hedge brushings. This has the effect of rotting and loosening the hardy woody shells, which are then easily removed by immersing the acorns in water and pounding them with the hard stubby end of a well-worn besom or birch broom.

Another method is to dry the acorns, first by exposure to the sun and then to gentle oven heat, finally boiling them for an hour or more; but the former process is preferable, since the fruit seems to sweeten and lose its acridity by storage. The best way to utilize acorns is to crush them or have them coarsely ground as required. A mash can then be made of three parts by weight acorns, two parts middlings, and one part linseed; or a similar quantity of acorns, two parts each middlings and maize meal. Mix the mash well with boiling water and set aside for some hours. Either of these mixtures works out at a ratio of just over 1 : 6. Another useful mash can consist of three parts acorns, two parts malt sprouts, and one part linseed, which gives a ratio of just over 1 : $4\frac{1}{3}$. In this latter case, however, the mixture should be prepared with stock-pot liquor containing fat. Fowls do not relish kibbled acorns, that is, when given as part of their grain ration; but the birds will eat them in a mash. Hence when acorns are plentiful they could be utilized in such a way. Always remember, however, that they should on no account be given to layers, because of their tendency to discolour the yolk.

Meals and Milling Offals

There is no standard for ordinary cereal meals, and the quality of them depends upon the quality of the grain used for grinding. This applies to them all, and also to what are known as milling offals—such as bran, middlings, etc.—although in this latter respect much depends upon the process employed in getting the offals. It is so even with what is now termed "weatings," that is, freshly milled middlings, sharps, thirds, etc. The greatest objection to meals is that, too frequently, adulteration takes place in their composition; and unless they are obtained from a thoroughly reliable source, such as a corn merchant fully conversant with the requirements of poultry, or a miller skilled in grinding, their components may not be pure. Blended with barley meal, ground oats, pea meal, and the like, even sawdust has been detected —"vegetable fibre" as an old friend of mine in the food line once termed it. It is because of this adulteration that, of recent years, there has been such a great vogue for proprietary laying meals, which contain ingredients of the best quality, scientifically blended, and in the correct proportions for heavy egg production.

These proprietary poultry foods are considered by some poultry-keepers to be too expensive for anything like extensive use; but when results are compared —and they are what count—the extra price may well be worth while. Instead of counting the cost of feeding a certain number of birds per annum, the poultry-keeper should consider what it has cost him to produce certain results. For instance, if a laying meal costing 16s. per cwt. resulted in an average of 200 eggs a head over the year it would be more economical than one which cost 12s. per cwt. and produced only 120 eggs a head per annum, because, as a bird eats only about ½ cwt. of mash (actual meal and offals) in a year, there would be eighty additional eggs for two shillings. I mention these figures merely to emphasize the fact that results count. But taking egg production and the general health of the birds into account, the judicious use of proprietary poultry foods is a sound way of feeding laying stock, and particularly when the producer is in direct touch with the consumer.

Now with regard to cereal meals and milling offals, one of the commonest in use, and especially on farms, is barley meal; and when it is pure it may safely be given to layers combined with other meals, etc., as mentioned in the tables set out earlier in this chapter. Unfortunately, however, sound grain is not always milled for use as poultry food; hence at times samples are very coarse and husky, while some are much adulterated. The buyer has no redress unless pure barley meal is stipulated; hence he should always ask for it, and see that it is invoiced as pure.

Biscuit meal, or, as it is sometimes called, poultry meal, is one of the most digestible poultry foods it is possible to obtain, while, since it is cooked and consists of "baker's seconds," and is often combined with meat, it is very palatable. There are specially made and granulated proprietary biscuit meals, and there are others, some of the latter being of doubtful quality.

The best kinds retain their form when soaked and swollen in boiling water, no matter for what length of time they stand, while the others almost invariably become pulpy after swelling. Most poultry-keepers consider biscuit meal too dear to be used extensively, which is certainly my experience; but for conditioning pullets for laying, there is scarcely a better food, while fanciers know its value for getting exhibition birds into their best form. In no case, however, should I use it as the sole meal for the mash, but always combined with bran and middlings and vegetables. Biscuit dust—fine biscuit meal, as it is sometimes termed—generally consists of screenings from bakeries; and when pure and unsweetened it makes substantial food, but screenings are not always pure.

Maize meal, consisting solely of ground whole maize, is a valuable food when properly employed in the diet, and I prefer it to any maize by-product. Maize flour is sometimes used; but although of tempting appearance, it is simply pure starch and really of no value. Maize meal should contain the germ of the grain. Like the corn, it increases the pigmentation of the egg yolk; but it must be combined with a food rich in protein. Maize germ meal is another form of maize meal, but it has a much higher percentage of fattening element. Gluten meal and gluten "feed" are residues from maize; the former consists mainly of the gluten layer and it is high in protein content; while the "feed," being the result of a less complete separation of the gluten layer, contains more fibre and less protein. Both are fairly rich in oil, although relatively poor in mineral matter; but, as I say, maize meal pure and simple is much preferable as food for the laying stock.

Sussex-ground Oats

Sussex-ground oats is one of the oldest of poultry meals; it should consist of the whole grain, skin included, reduced to a fine flour. To many people it is a standard food; but it must be remembered that the quality of any sample depends entirely upon the quality of the oat used for grinding, and in this, as in most meals, there is a difficulty in getting a pure sample. There is no doubt that the old Sussex poultrymen who originated this meal as a poultry food used a percentage of barley—generally one sack of barley to eight sacks of oats—because the addition of barley helped to keep the grooves of the specially-dressed Derby grinding stones clear, and thus facilitated the milling. By this old process, either by water mill or windmill, these specially dressed stones were run at a slow speed, producing on an average about 1 ton of meal an hour.

Nowadays, however, there is a difference in the mode of manufacture, and the new system adopted by special machinery will turn out 3 tons an hour. But the greater the velocity the greater the heat generated, and that heat draws off in vapour the oil which is so helpful to enable the meal to be digested. Despite the addition of barley, the original mixture makes a very excellent feeding meal, far in advance of some of the pure ground oat samples which are sold to-day. The best guide for the novice in selecting a good quality Sussex-ground oats is to note the feel, and see that it is soft and not of a dry powdery nature. Take a handful, squeeze it, and then drop it; if it breaks away loosely it may be pure ground oats, but the mode of manufacture has deprived it of that oil so essential to it. Genuine Sussex-ground oats will retain its shape when pressed in the hand, and, moreover, it has the "smell" of oatmeal. It is of a cream shade rather than pure white, this latter generally being obtained by the inclusion of dari, which is added to improve its colour and general appearance.

In selecting meal of most sorts, that is cereal meals, it is always a good plan to note the feel. It should be soft and not of a light and powdery or "woolly" nature; some so-called poultry meals contain a large added amount of husk and fibre. This is not altogether surprising when one considers that nowadays grain husk can be ground to resemble fine meal which, by unscrupulous people, is included in "meal" sold at low rates. It was an old habit of mine not only to submit meal to the nose and eye tests, but to chew it, to work up a little in my mouth; it should taste smooth and not gritty. But I must admit that, since putting a doubtful sample under a microscope and observing particles being moved by really horrible looking "vermin," I make very sure of the smell before tasting! Meal can also be tested by pouring hot water over it in a saucer or putting it into a narrow test tube with water. At any rate, such tests as these are good enough for the layman.

Bran and Middlings

Of the milling offals bran and middlings are the most valuable. Bran, as most folk are probably aware, is the outer skin of the wheat berry; and, from the poultry-keeper's point of view, it is a pity that millers, in their anxiety to get as much flour as possible from a sack of wheat, are able, with modern milling machinery, to clean the skin of the wheat of every particle of the second lining. Twenty to thirty years ago, bran was very floury, particularly the broad grade, and the flakes were almost as big and as thick as threepenny pieces. In those days, too, it was clean, that is, bran without any oat husk or screening matter at all, while to-day it is by no means rare for bran to contain husk which never came from a wheat berry. It is for this reason that poultry-keepers should insist

on home-milled bran, and thus be ensured of obtaining a good sample—free of the foreign husk mentioned—and bran from wheat only. When bran is genuine wheat skin—and even the best, nowadays, is merely a thin skin—and not, as often happens, a mixture of oat husk and screenings, it is beneficial, not specially for the feeding value it possesses, but for its digestibility and action on other food which is contained in the crop of the fowl at the same time. In the process of digestion, it sets free a nitrogenous principle, which has the power of quickly converting starch into sugar; hence, for example, bread which contains bran is more readily digested, owing to the insoluble starch of the flour being converted into sugar, which easily dissolves. Consequently, bran is valuable in poultry feeding, to mix with such starchy foods as barley meal and maize meal.

Middlings, now standardized as "weatings" to ensure its being made solely from wheat, is the layer between the outer husk or bran and the white centre of the berry or baker's flour. Middlings, as it is called in London, is known by other names in different parts of the country, such as toppings, thirds, sharps, pollards, dan, boxings, and parings. Three different grades are obtainable, viz. straight run, or middlings just as it is separated from flour, and containing a proportion of coarse flour; coarse middlings, from which all the fine particles have been removed; and fine middlings, from which all the coarse particles have been removed. Of course, there are different qualities of each of these three grades; but what we require, as a really good ingredient for our mash, is the straight run grade. To use the coarse grade of middlings would reduce the feeding value of a mash, while to use fine would increase the body or solid part of the mash. I find that "super-fine" middlings, or toppings, is the best quality I can obtain from my local corn merchants, and the slightly extra price demanded is worth paying. It is as well to remark that nearly all the mineral content of wheat is to be found in bran and middlings; hence they are two valuable foods to use in mashes, although considered as offal by the millers, because the public fancy is for white bread.

Measure *versus* Weight

Before passing on to consider vegetables and animal matters, and other items in connexion with the diet of fowls, let me say a few words about quantities. When fowls are laying steadily, the grain allowance is reckoned as about 2 oz. a head, rather less in summer and more in winter, and the wet mash—the meals, etc., after being prepared with water—as practically 4 oz. There is no specified daily allowance of dry mash, simply because this food is generally accessible at all times, and more than one day's supply of it is put into the hoppers.

Now, although I always mix dry mash by weight, I almost invariably use measures when preparing wet mash and putting it into the troughs for the fowls, and also when supplying them with corn. I do so because I find it considerably facilitates matters; in fact, to weigh the wet mash, when several pens of layers have to be fed, would be quite impracticable, and it would mean nothing short of taking scales on the food rounds or putting the allowances for the various pens each in its own container. As it is, the birds get about as many handfuls of sound grain as there are busy hens or pullets in the run, while of wet mash, the quantity is a 2½ gallon bucketful for fifty to sixty, or an average of a heaped-up tablespoonful a head. I admit that handfuls are not altogether reliable as regards weights, because one man's fist may hold perhaps double as much as another's, while the weight of a handful of corn taken fingers downward is less than that of one taken palm upward. For instance, with my right hand grasping grain (palm down) I pick up about an eighth of a pint, according to the species of grain. I can pick up a greater bulk of oats than wheat or kibbled maize, while, as regards weights, the quantity averages as follows—

Wheat	A trifle over 2 oz.
Clipped oats	2½ oz.
Kibbled maize	2¼ oz.
Dari	2⅜ oz.
Barley	2⅛ oz.
French buckwheat	1½ oz.

I have mentioned a bucket; and one of the capacity stated (20 pints) holds 125 handfuls of grain, with weights as follows: Wheat or kibbled maize 18 lb., or clipped oats 15½ lb., which means that one pint would average 14½ oz. of wheat or kibbled maize, or 12½ oz. of clipped oats. Checking these with a pint pot, and using strike measure—striking off the grain above the top with a straight, flat stick to ensure exact measure—I found that red wheat weighed 16 oz., clipped oats 12 oz., and kibbled maize 14 oz. But even to feed by strike measure would be an intolerable nuisance when on the food round; hence I always adopt hand measure with grain. The bucket in question holds, strike measure, an average of 10 lb. Sussex-ground oats; 16¼ lb. maize meal; 15 lb. pea meal; 8 lb. middlings; 5 lb. bran; 4 lb. clover meal; 6½ lb. alfalfa meal; 17½ lb. meat-and-bone meal; 17½ lb. fish meal; or 15 lb. meat meal. These weights are of dry meals, etc., and not of wet mash.

Poultry foods, at any rate grain, cereal meals, and milling offals, are now bought by weight; but while there are standard weights for measures in grain, few poultry-keepers purchase their food on such a system.

In any case, even when fowls are at the height of their laying season, two full meals *per diem* will generally be ample for them; and by a full meal, I mean a cropful of food. When feeding by measure, therefore, because it is much more convenient and quite as efficacious as feeding by weight, it is advisable for the feeder to check his own measures of foods for his own guidance, always remembering to feed with the eye as well as the hand.

The Question of Sacks

It must be noted that as poultry foods are now sold by weight, the weight of the sack must be allowed for; that is, for instance, a sack of 1 cwt. of meal or grain should scale 112 lb., plus the weight of the sack containing it. I understand, however, that it is the custom of the trade, when no charge is made for sacks, to let them form part of the weight of the bulk, whereas if they are returnable, the contents of them are net weight. If it be so, then those who retain the sacks may think they pay heavily for them, because they are paying for the sack at the price of the meal or corn it contains.

As a matter of fact, though, while the cost of the sack to the purchaser would naturally vary according to the price paid for the contents of it, the poultry-keeper can scarcely complain of being "done" when it is paid for at such a rate. To satisfy myself on this point, I weighed a couple of very serviceable sacks (empty), the one, brand new, having contained 1 cwt. of wheat, and the other old, of stouter material, used for a similar weight of maize meal. Both had been well shaken free of their contents—and it is surprising the quantity of food one can lose in a ton, if the sacks are merely emptied! However, the former sack scaled exactly 1 lb. and the other $1\frac{1}{4}$ lb. At one time it was the custom to charge 6d. a head for sacks, allowance being made for returned empties. At that price, they were not cheap; but at the present rates, one can scarcely complain, because at 9s. 6d. a cwt. for grain, the sack would cost a fraction over one penny.

Admittedly, 1 lb. loss of food per cwt. runs not far short of 1 cwt.—100 lb. to be exact—on a 5-ton lot; but the rate per cwt. paid for such quantities means a considerable reduction. It has been put to me that 1 cwt. being 112 lb., then that, and nothing less, should be the weight of the contents of the sack. That is so. On the other hand, how many of us who pay for a quart of milk or a 2-lb. loaf of bread get the exact measure or weight when each is delivered at our house? And in neither case is there a wrapping which can be utilized—my milkman demands the return of the bottles, while the baker does not deal in wrapped bread. Granted that "two blacks do not make a white." Perhaps we could insist on net weight when purchasing poultry food; but the corn merchant could also insist on the return of the sacks, or make a charge for them. It is not a matter that worries me, provided the whole delivery scales the correct weight.

Some good use can always be found for sacks on a poultry farm, and particularly in the young stock runs; if carefully picked to pieces they have a wide spread, and the gunny or other material of which they are made can be utilized as a wind-break, shade from the sun, a blind for the sitting-box, a floor for the chicken coop, and for many other purposes. I just see that the sacks are free from all food—a dusty matter with barley meal—and store them in a dry place for future use.

Vegetable Food

I have said that fowls should be provided with vegetable food in some form. Every poultry-keeper, large or small, should endeavour to raise at least a portion of that daily ration of green food, the imperative necessity for which, though seldom questioned, has never been so impressed upon all practical feeders as it has been since the scratching shed, the intensive system, dry-feeding and other innovations have become popular. Moreover, the fact that we have, in poultry manure, one of the best of all nitrogenous fertilizers for the production of the whole of the most useful green foods given to poultry, should in itself encourage all who have the space to grow their own crops, and thus effect an obvious stroke of economy. For preference, greens should be supplied to layers in a live state, that is, fresh and crisp; hence the great benefit of growing them at home. The quantity they should get will vary according to the circumstances in which the birds are kept.

On a wide grass range fowls will find sufficient to satisfy them, except during a particularly dry spell in summer or in the depth of winter when the ground may be frost-bound or covered with snow. In small runs, however, and even in those which are grassed, layers should be provided with vegetable matter throughout the whole year, and especially during the moulting season and in hot weather. There are two forms in which it can be given to them, viz. raw and cooked. The former is decidedly the better, since, while cooking may improve the palatableness of some kinds and, moreover, permit of the use of vegetables which would otherwise be valueless, it removes from them some of their useful properties and generally destroys the vitamins. When, therefore, it is necessary to utilize waste parts of vegetables, such as the peelings, coarse outside leaves, stalks, and so forth, the water in which they are boiled should always be

used for preparing the wet mash. Thus, while the vitamins may be destroyed, the birds will get the mineral matter.

Raw greens should be young and fresh; leaves which have been damaged by frost or those which have been cut for so long as to become limp and tough are useless. Green food is best fixed securely against wire-netting about 1 ft. from the ground, or

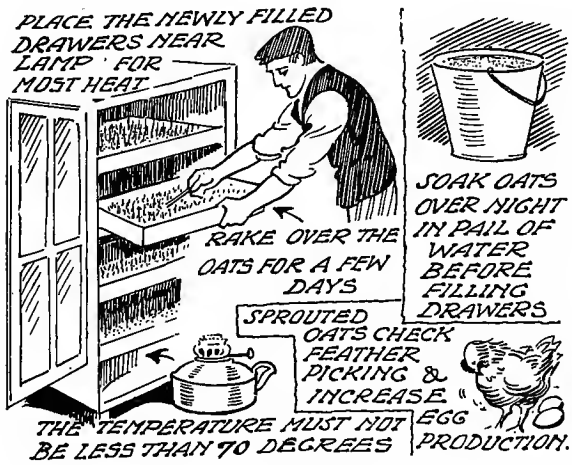


FIG. 143. SPROUTED OATS

Some poultry-keepers provide their layers with sprouted oats in winter, when fresh green food is not available. A cabinet can be utilized for the purpose. The trays can be 2 ft. square and 1 in. deep, made of galvanized iron, and the bottom pierced to permit of draining. They should be 8 in. from each other and 1 ft. 6 in. from the floor, for the lamp

just high enough for the fowls to get it with ease. This is decidedly preferable to throwing it into the run, where it will be trampled on and fouled. I have, at times, put oddments, well chopped, into a rack made of laths about 1 in. apart, into a string-netting bag suspended to force the fowls to reach for them, and into a trough; but these ways of supplying green food generally lead to some of it being wasted, particularly if the birds can get at it with their feet.

Various Kinds of Greens

Almost every kind of green grown in the kitchen garden is suitable, as well as rape, green alfalfa, clover, and lawn clippings, as long as they are young and fresh. Onions are particularly beneficial, since they aid digestion and tend to ward off ailments, although they should not be given in large quantities to laying hens, because they are liable to impart a very distinct and unpleasant flavour to the eggs. Lettuce (the Cos kind) and endive are also useful; but, if there be an odd patch of ground, it will well repay the poultry-keeper to cultivate perpetual kale for the birds. It is a very hardy plant, requires little attention, and is relished by growers and adult stock; I am never without a good supply of it, but gardening is one of my hobbies.

The town poultry-keeper can maintain a regular supply of green stuff by sowing (in a bed or boxes) a patch of grass and clover seed, and covering it with 1 in. mesh wire-netting raised on a frame 2 in. to 3 in. deep. Mustard and cress can be produced in boxes almost anywhere and at most seasons. Shallots, planted together in boxes of good soil 8 in. deep in February, will produce an excellent green stuff for adults in spring; and if a few handfuls of oats or barley are sown and netted as advised for grass, they will maintain a steady growth of blades for many weeks. In good soil and in partial shade, nasturtium will grow rapidly and produce an abundance of leafage which is highly beneficial to poultry in confinement. The climbing variety will cover a wall and take but little space; it is an excellent town plant. For producing a succession of lettuce, endive, mustard and cress and other quick-growing vegetables in winter and early spring, the small poultry-keeper will find a garden frame, which can easily be made at home, an immense advantage. Though one cannot raise vegetable food in quantity under glass in this way, a little is better than none, especially during the hard season; and there is satisfaction in knowing that a handful of really fresh green stuff, properly used, is more wholesome and economical than a barrow-load of tough and faded leaves.

Bulbs or roots, such as swedes, mangolds, turnips, beetroots, carrots, and potatoes, can be utilized when fresh green vegetables are scarce. They can be given raw (sliced or split in halves) or boiled and mixed with the meals, etc., for the wet mash. In the former case, so fix them that they cannot be dragged about in the dirt. One thing to notice is that if swedes are given in large quantities to laying hens they are apt to impart a peculiar flavour to the eggs, while mangolds have the effect of fattening the fowls and rendering the fat intensively yellow. Potato parings, common in most households, are serviceable when chopped and boiled, since they contain mineral salts. Nettles, dandelion, chicory, parsley, and corn salad, as well as all the mild succulent weeds, are beneficial as green food. Nettles should be gathered when young, cut and not pulled, and boiled for use in the mash; and in spring and summer there is scarcely a better tonic for fowls. But the other kinds can be chopped raw, and mixed with the wet mash just prior to drying it off with middlings, since few fowls will eat them if put into a trough. Any grain which has commenced to grow is suitable vegetable food; and sprouted oats are about ideal for the purpose, particularly for hens which are kept on the intensive system. A section,

roots as well as sprouts, about 2 sq. in. is sufficient for each adult fowl.

Dry Substitutes

Among dry substitutes may be mentioned meadow and clover hay—the latter is more nutritious than the former—clover meal, alfalfa (or lucerne) meal, and malt sprouts (culms or combs). Hay should be chaffed into $\frac{1}{8}$ in. lengths, and the desired quantity—a handful of the dry chaff will be ample for a score of fully-matured birds—placed in a bucket, well scalded, and allowed to stand for some hours before being mixed in the wet mash. Malt sprouts should also be treated in a similar manner; but clover meal and alfalfa meal —really finely cut hay and not, as some people imagine, ground meal—can be mixed with the other ingredients when the wet mash is being prepared, or with dry mash, in such quantities as have already been stated in the various mashes mentioned earlier in this chapter. In my opinion, alfalfa is the best dry substitute for green food; but the buyer should insist on pure alfalfa, and not meal which includes dust from the chaff box or sweepings from the chaff cutter. It should be sun-cured alfalfa-leaf meal.

As a rule, the best time of the day to supply fresh green food to pullets is with their morning meal, so that the birds can partake of it at will and not be tempted to gorge on it when they are hungry; but in winter, when roots are provided, they should be given at midday, so that they will not freeze and become unpalatable. Any vegetable matter which remains in the run at the close of the day should be removed, because decaying green food partaken of by fowls will lead to serious trouble.

Animal Food

Meat in some form is beneficial for layers, and unless the birds are kept where they can obtain a supply of it from their range, they should get it as part of their daily rations. It should not be provided separately, as an extra meal, but be thoroughly mixed in the mash, so that none of it stands out prominently. Sound scraps should be boiled, since in such a state meat is more of a tonic and less relaxing than when raw. Crushed raw bone, or that which has been put through a cutter and known as "cut green bone," makes a suitable substitute for flesh; in fact, when combined with meat scraps in equal quantities, it is particularly beneficial for layers. Some poultry-keepers give their fowls a meal of crushed bone once or twice a week; but I prefer to let it form part of the wet mash and seldom in greater proportion than 10 per cent. Waste from sound fresh fish, heads as well as bones, can be utilized in the diet, but it must be boiled and put through a mincer, when it can be mixed in the wet mash. One part of it to nine parts of meal, etc., will in no way taint the eggs, provided it is free from oil. Any scraps or trimmings of meat or fish, as long as they are sound, can always be put to good use where fowls are kept.

In addition to the foregoing, there are different kinds of dried meats obtainable from suppliers of poultry foods, and these include granulated meat, meat cake, beef scrap, meat-and-bone meal, meat meal, fish meal, and fine greaves. Their condition can generally be ascertained by soaking a handful in plenty of boiling water and noting the flavour; if there be anything of a particularly rancid or "strong" smell about them, beyond what one would naturally expect of meat and fish which have been preserved, they should be discarded, since, while such food may not in the least affect the health of the birds, it will undoubtedly taint their eggs, and not lead to good business. Admittedly, greaves are apt to give off a somewhat pungent odour when tested in such a way; and yet if they are obtained from a reliable source, and have not been chemically treated, they may safely be used after being thoroughly boiled. However, when dried meats have to be employed in the diet, then fish meal, meat meal, meat-and-bone meal, and bone meal of reputable brands should be purchased. Animal protein in such forms is decidedly handy. There are times, admittedly, when poultry-keepers in a modest way can manage to provide their hens with all the animal proteids the birds require, by arranging for supplies from the butcher or the fishmonger; but few poultry-farmers can do so, at any rate in anything like sufficient quantity to be of service. Hence, resort must be had to the commercial meals of this nature, which I certainly find reliable in every way.

When bringing pullets on to a meat diet after they have been taken off the range for winter production, I begin with what might well be termed a flavouring. That is, at the start, the proportion of the dried meats never exceeds 2 per cent (one part in fifty) of the mash; and this is gradually increased as the system becomes accustomed to it, but seldom does it exceed 10 per cent. With light meats or fish, double that quantity can be allowed, either boiled and minced, or boiled to shreds and resembling a thick broth. Freshly-ground bone or "cut green bone" should be limited to $\frac{1}{2}$ oz. a head *per diem*; but I seldom make the allowance of it more than $\frac{1}{4}$ oz. for each bird in full lay. All animal protein must be used with discretion and be considerably reduced when the diet contains any quantity of beans, distiller's grains, gluten meal, linseed, malt dust, peas, soya, or dried yeast—foods which have a high protein ration.

Other Items of Diet

There are other foods which can be included in the diet of laying hens. House scraps comprise one of them, those scraps that include everything edible which is discarded by the cook or left at table, such as the outer leaves and parings of vegetables and fruits, pieces of bread, trimmings of meat and fish, and so forth. I am often asked if there is any economy in using such scraps. There certainly is, provided that waste is not made in the house specially for the fowls. If there be a great deal of waste in a small household, it means not only that the birds are eating rather expensive food, but that it is being charged to the house instead of to the poultry. Some writers have asserted that half a dozen hens can easily be maintained in good laying condition if fed solely with the leavings and scraps of an ordinary household; but, if so, then it must be a case of making waste. In most houses, however, there will be some vegetable scraps, because few folk eat the "skin" of potatoes, turnips, etc., the bottoms of sprouts, the coarse, outside leaves of cabbages and other greens, while there will most likely be a bone or two not reduced to a billiard ball state, and some top slices and crusts of bread. And there may be neighbours who, while not keeping fowls themselves, appreciate a few eggs which could be exchanged now and then for the waste from their kitchens. All these items can be profitably employed in the diet, and they will help the small poultry-keeper to reduce his food bill.

In giving this class of food, however, one should endeavour to balance the total diet. For instance, if the bulk were potato peelings and cabbage, then a little extra fish meal or meat-and-bone meal would be required, while if the waste consisted of meat or fish—be careful about the latter, because fish oil will taint eggs—the mash would naturally not require dry animal protein. Use every scrap of free food that can be obtained, but know what it is and what must be combined with it to make the whole diet balanced. Bread alone, and particularly white bread, is really poor food for layers, but if used with an equal quantity of bran and middlings and 10 per cent of fish meal, it forms an excellent change mash with the usual mixture. Sour milk should never be discarded; if the art of sour milk cheese or scone making is unknown, put the milk into the layers' wet mash. Bread can be oven dried and then ground, or just soaked in water, milk, or broth from broken bones. The odd bones can be boiled until all the "goodness" is out of them, or they may be broken with a "toothed" hammer (or a hand grit crusher) and put down as grit. They may even be burnt and supplied to the birds as charcoal.

Of distillery and brewery by-products, there are brewers' grains and dried yeast, in addition to malt sprouts, which I have mentioned under vegetables. Brewers' wet grains are of little value, but, when dry, they are useful for summer feeding, or at any time when fowls are not required for heavy production. Brewers' dried yeast, known in some parts of the country as "barm," is the yeast formed on brewing liquors, being the surface or top yeast. For layers, the allowance is 5 per cent, as mentioned early in this chapter, in one of the mashes containing potatoes; and it may be mixed with the mash just before the food is ready for the birds, or allowed to soak with the other ingredients of the mash. Cattle cakes have been advocated as food for layers; but they would have to be ground to powder before they could be incorporated in the mash, whether wet or dry. Linseed cake meal is useful at times, but it has a laxative effect on fowls and should not be given to them as part of the usual daily ration. As a rule, though, these cakes should be excluded from the diet.

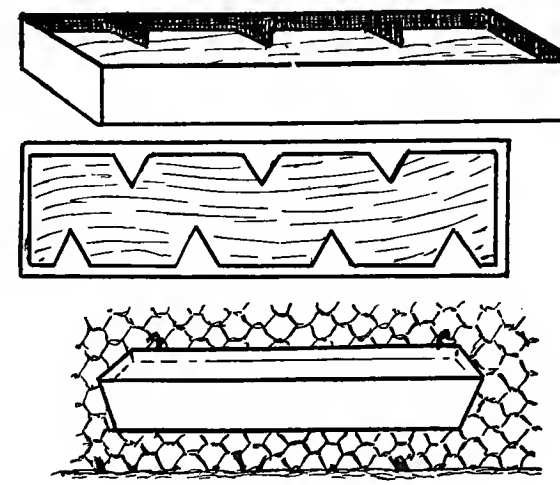


FIG. 144. WATER VESSELS

Outside drinking troughs for chickens can be put on slats or wire-netting frames; but as long as clean water is available for layers no such platforms are required. Many of my troughs hang against the fence, about 2 in. from the ground. Some people who keep Minorcas and other fowls with large combs and wattles, use a notched board (as shown above) in the trough during winter to prevent frost-bite

The Drinking Water

The importance of a plentiful supply of water cannot be over-estimated; it is one of the essentials of life. When hens are in full lay, a score of them will easily drink a gallon *per diem* in summer; and they will take as much of it in winter, too, if it be not ice-cold. At the farm here, we have a copper, in an outhouse, which is filled daily throughout winter, so that the birds' drink can be given to them with the chill off; and the results more than repay us for the

fuel and the extra labour it involves. In the cold season, we make a habit of emptying the water troughs at the shutting-up round; and the warmed water given at breakfast time is appreciated. Small quantities of water exposed to the sun lose their freshness and satisfying qualities; but a drink with the chill off is never refused by the layers in winter. Some poultry-keepers fit their water troughs with heaters in winter, and there are lamps made specially for the purpose; but if the containers, during frosty weather, are put inside the house out of draughts, the water will seldom freeze during the day.

The vessels must be kept clean; if they be occasionally scrubbed out with sand, slime is not likely to collect. Keep the water in the shade during summer, but where air can get at it; and, if the ground does not drain well, stand the trough on a frame of slats or ½ in. wire-netting, an inch or so high, and with sufficient room to enable the birds to drink with ease. As a rule, fowls are clean drinkers—unlike ducks in that respect—but some of them spill more than they swallow, and not all of them hold their heads directly over the trough.

The Value of Grit and Shell

Grit is not food; but poultry eat it. An old friend of my early days always impressed on me that there is nothing so essential for fowls as grit. Without it, he used to say, birds cannot digest their food, as a lack of it prevents the gizzard from functioning properly, and the result is impairment of health. That fowls can be reared without grit, however, I have proved on more than one occasion, as have others, and whether stones are present or absent, it will have no effect on the gastric juice secretion or on the muscle movement of the gizzard.

It has been said that dry mash may cause disease if not properly pulped in the gizzard; but, although we hear much nowadays about soluble and insoluble grit, and that for the proper functioning of the gizzard the latter type is essential, my own opinion is that there is too much theory about grit. I have seen it stated that 2 oz. of wheat would maintain the body-weight of a hen which had had her gizzard stones removed, but less than that would do if grit were provided. If that were so, then economy in food should be effected, since the best of grit costs nothing like the best poultry food. However, fowls do take gritty substances, granted the opportunity, because some will generally be found in the gizzard of birds which enjoy a wide range.

Scientists tell us that a certain percentage of grit goes to form the plumage, bones, etc., of the bird, while the mineral matter in it serves the same purpose to the fowl as common salt serves to man, namely, to effect the chemical combination of the food material. Granted these elements are found in various grains, seeds, and the like, of which poultry partake; but, apparently, they are not in the food in sufficient quantity for the needs of layers which have to produce the large numbers of eggs now demanded of them. Hence the necessity of providing hens and pullets with grit, if they be kept where they cannot obtain it for themselves. In this case, it is easy to let them have insoluble as well as soluble grit, by mixing flint, limestone, and crushed oyster shell or cockle shell —the latter being quite as good as oyster shell—in equal parts by measure and giving it to them once or twice a week with their grain ration; or, if the all dry mash system is adopted—it is by no means popular in this country—put it into the hopper with the soft food. About 2 lb. a week for a hundred hens should be ample. This is preferable to keeping a supply of grit, etc., in boxes or troughs always before them, because some hungry hen might be tempted to take more than she required for the mastication of her food.

Mineral Mixtures

Mentioning minerals reminds me that, under modern conditions of feeding and production, laying hens may require more than they can obtain from grit and natural foods. Some experts advocate mineral mixtures for all kinds of poultry; but many practical feeders get excellent results from their birds by not using any mineral supplement. As a matter of fact, if layers are provided with a properly balanced diet, and they have access to an extensive grass range, they will thrive and lay well without other minerals than those which they obtain from their food. No doubt a mineral mixture is necessary for heavy layers which are kept intensively, or for those which cannot obtain supplies of fresh greens and natural salts from the oddments they would find on range; but I cannot say that mineral mixtures appeal to me as a necessary part of the diet of hens and pullets which live under normal conditions. However, for those which are kept intensively, there is a choice of three or four. The original mineral mixture, recommended after joint investigations carried out at the Agricultural Institutions in Scotland and the North of Ireland, is as follows: bone meal 50 per cent; chalk 20 per cent; common salt 20 per cent; sulphur 5 per cent; iron oxide 5 per cent, with a trace (1 in 200) of potassium iodide. The mash used in these experiments consisted of wheat offal (bran and middlings), ground maize, ground oats, and bean meal; and 5 per cent of the above salt mixture was added to it, roughly 5 lb. to every cwt. of meal, etc., made up in a dry state.

Another mineral mixture for layers, recommended by the Harper Adams Agricultural College, is com-

posed of sterilized steamed bone flour 55 lb., ground limestone 20 lb., common salt 20 lb., and sulphur 5 lb., and this is also used as 5 per cent. A third is as follows: Steamed bone flour 60 lb., ground chalk 20 lb., common salt 20 lb., and sulphate of iron 3 lb.; quantity, 2 lb. to every 100 lb. of dry food to be made into mash. All the foregoing are advocated by different authorities; and yet, if the keeper of laying hens imagine his fowls are short of minerals, he might do worse than mix 1 lb. of common salt in every cwt. of mash, or, as I do at times, put a pinch of salt or flowers of sulphur in the soft food. It can be imagined that it is not an easy matter for the novice to decide when his birds should have an added amount of minerals, or when, in fact, his layers should get a mineral mixture, and to what extent it should be given. If he takes my advice, he will let it form a part of the diet only during winter, when his pullets are being kept intensively and when there is generally a shortage of fresh green food.

As long as the birds are getting well-balanced rations, with what they require of vegetables, and are producing plenty of strong-shelled eggs, there is no need to give them anything in the way of a tonic. Admittedly, poultry do sometimes require toning, particularly when they are laying prolifically, because heavy production can only be obtained by heavy feeding, which is apt to upset the liver. Such, at any rate, is what I find; hence, rather than resort to mineral mixtures, I give them a pick-me-up in a plain form, viz. sodium sulphate, known as Glauber's salt, made as suggested for use with sluggish pullets. This is about the best tonic possible for layers; and it can be given to them in their drinking water, or if they get wet mash, then in their food, twice a week until normal conditions prevail. Some poultry-keepers use magnesium sulphate (Epsom salts) for the purpose, but I find sodium sulphate preferable. However, as long as fresh green vegetables are available, and the diet is correct, there should be no need to give fowls a tonic.

The Question of Vitamins

Before concluding these notes on poultry foodstuffs, mention must be made of vitamins. Until comparatively recent times, poultrymen were content to rely for egg production on providing their fowls with a diet containing a good balance of proteids, fats, carbo-hydrates, and minerals, which, combined with a wide range, gave excellent results. It is said, nevertheless, that so much is now demanded of the hen in the way of production that these balanced rations may not suffice. But, when this is so, then, in my opinion, it can only be the result of a change in the value of meal, etc., obtained by modern methods of milling, and the growing tendency among poultry-keepers to provide their birds with what I have always termed the sawdust type of ration, containing dry and stale meals and offals which would have been considered as so much waste in my young days, and not even "fit for pigs!" However, accessory food factors, called vitamins, are suggested as necessary to complete the diet. In connexion with the food of human beings, we are told that science has discovered the existence of eleven, or more, vitamins, each of which is considered essential for a certain phase of growth, or for the prevention of a particular type of disease; that these vitamins are chemicals of vital importance, and that they are present in minute quantities in most foods. No one food possesses all of them in the quantities required by human beings, and, in consequence, it is necessary to eat various foods to obtain the requisite amounts of each.

Applying this to the feeding of poultry, we see "the reason why" our birds require a varied diet, such mashes, etc., as are suggested in this chapter. Still, without delving too deeply into the matter, it may be said that vitamins, or the subjects from which they are derived, are found primarily in plants, while those present in animal tissues have come from the plant food direct, or have been made in the animal from the precursor substances supplied in the food. For convenience, the vitamins are distinguished by letters; but, since only four of them can be of any benefit to fowls, they alone will be mentioned. These are A, called anti-infectious or anti-ophthalmic, because the usual symptoms of vitamin A deficiency in human beings are associated with infectious and eye troubles; B, anti-neurotic, due to the fact that, in its absence, the outstanding symptom is that of a nervous disorder; D, anti-rachitic, on account of its relation to rickets; and E, anti-sterility, because sterility may result in the absence of it.

Each vitamin has to be considered individually, since one cannot be substituted for another in the same way that one carbo-hydrate can be replaced by another. Vitamin A, the fat-soluble, growth-promoting, disease-preventing one, is generally found in all animal fats except lard, in fresh milk, in certain oils (cod-liver, especially), in plants, vegetables such as spinach and cabbage, and grain; the principal sources for poultry are yellow maize meal, alfalfa meal, cabbage, carrot, grass, and cod-liver oil. Vitamin B occurs in the seeds of plants, in the germ and bran of grain, in the eggs and internal organs of animals, in meat, in yeast, and some other foods. Vitamin D usually occurs in association with A, in most animal fats, milk, cod-liver oil, eggs, and green-stuffs. Vitamin E, like A and D, is also found in fats, vegetables, and seeds,

and in wheat and yellow maize, but it is present in some vegetable oils which do not contain these other two vitamins.

Experiments with vitamins in connexion with the feeding of poultry show that a deficiency of vitamins in the rations may result in pathological disorders, and that the effect of a deficiency eventually shows up in one form or another. For instance, retarded growth and development, impairment or loss of appetite, digestive disorders, loss of weight and vigour resulting in physical weakness, white diarrhoea, consumption, inflamed and swollen eyes, one-eyed or watery roup, leg weakness, anæmia, swollen joints, rickets, soft bone, bone deformities, soft-shelled eggs, loss in egg production and egg size, and poor hatchability, are all said to be due to a deficiency in the ration of one or more of the vitamins. And yet, one authority claims that a ration containing sufficient vitamins to prevent the more typical symptoms of vitamin deficiency-diseases may be inadequate for the maintenance of good condition and health.

Those who are keen on the subject declare that a complete poultry food must contain the necessary vitamins for the particular conditions under which that food has to be supplied. Nevertheless, it is exceptional for a ration, balanced under practical conditions, to be so devoid of vitamins as to lead to trouble. It can be taken for granted, therefore, that fowls get all the vitamins they require when they enjoy free range and are properly fed, that is, when their diet consists of the usual cereals (such as wheat, oats, and maize, and sound milled products therefrom), meat, animal fats, and fresh young green food or substitutes.

So far, I have not found any authority state the exact amount of any vitamin or combination of vitamins which poultry require to maintain them in perfect health. In the circumstances, therefore, the average poultry feeder may be excused if he leaves vitamins to the scientist, and pins his faith to sound food and common-sense feeding, because layers which get properly balanced rations, by no means a difficult matter to arrange, and have access to a clean grass run, will not lack for vitamins. As it is, reliable investigations have proved that added vitamins are not only unnecessary in the diet of fowls which are kept under such conditions, but that they may even prove detrimental, as for instance, an excess of cod-liver oil as a source of vitamin A will produce eggs with almost colourless yolks, which, although rich in this vitamin, would not be a success commercially. On the other hand, maize or fresh greens will give a deep pigmentation to the egg yolk. It may be as well to mention, also, that the vitamins may be removed from the food as in the milling of grain, or by solution in water as in the cooking of vegetables, while storage of the latter may affect their vitamin value.

A Simpler Problem to Solve

I have always been, and am still, a great believer in an ample supply of fresh green-stuffs and vegetables for poultry, and especially for layers, because I know their value in the production of sound eggs; and attention to this part of the fowl's diet will prove a much simpler problem to solve for the average poultry feeder when preparing his foods, than attempting to puzzle out how to secure the presence of vitamins in the requisite quantities, if, indeed, such quantities are known. In view of the fact that remarkably good egg records are obtained at laying tests, by the use of diets which have certainly not been balanced according to their vitamin content, there would appear to be some benefit in rations which are made up in a more or less rough-and-ready way, and based on observation and experience, rather than made up to any scientific formula. Science and scientific research help us considerably; but we must use such knowledge with common sense gained from practical experience.

Admittedly, it might be different if layers were to be kept solely under unnatural conditions of close confinement, that is, on the intensive system without any outside run, and, too, where they could not get the benefit of sunlight in winter. In such circumstances as these, some attempt might be made to study vitamins; but it must be remembered that a diet, the chemical composition of which is satisfactory, is sufficiently rich in its natural vitamins. When one realizes the tremendous health and growth-promoting value of fresh, succulent green-stuff and sprouted grain, and how easily they can be obtained at practically all seasons of the year, it would be somewhat foolish to omit them from the diet in favour of vitamin-rich substitutes. These latter are, without doubt, of considerable value; but they should be used merely to make up a shortage of the natural supply, rather than as a complete substitute for it. And, after all, it is really not difficult to ensure an almost constant supply of fresh greens or root vegetables. They may have a low nutrient value; they should not be regarded as egg-producing or tissue-forming, but for their medicinal values, as protective foods, giving better health, growth, and functional activity. Raw greens and root vegetables may not contribute much to the ordinary nourishment of the fowl; but they certainly act as tonic food, assisting to keep the birds in good condition, and at the same time improving the quality of the egg and imparting to the yolk a fine orange tint.

As a result of intensive study, research work, and

experiments in connexion with the subject of vitamins during the past few years, two of the most common in use to-day are cod-liver oil and dried yeast. Cod-liver oil is a food in which the vitamins A and D are highly concentrated; and it is estimated to contain more than two hundred times as much vitamin A as butter. Nevertheless, when laying fowls are kept on a grass range and fed normally, the addition of cod-liver oil to the diet has not been found to increase egg production. On the other hand, however, it has proved highly beneficial for use during winter in the rations of birds kept intensively, and which do not get regular supplies of fresh vegetables. In such cases, a small amount of cod-liver oil—never exceeding 1 per cent of the mash or grain—may safely be allowed daily.

As regards dried yeast, it is probably one of the richest sources of vitamin B. Its high protein content, combined with its deficiency in fat and fibre, makes it not only nourishing but an almost entirely digestible food. It is said to enhance the value of other foods consumed with it. Like cod-liver oil, however, it does not appear to have any beneficial effect on laying fowls which are kept on range and are given properly-balanced rations; that is, the addition of dried yeast to the diet of such birds has not been found to increase egg production. But in a ration deficient in proteids, as for instance, in one containing potatoes, it could be used at the rate of 5 per cent, in which case it would ensure good production from pullets, and do much to improve the health and vitality of matured stock.

To sum up this subject of vitamins, it will be found that fowls which are kept under what we term free range conditions, where they get the benefit of sunshine and fresh air, and plenty of exercise, should not suffer in health or production if they are given a properly-balanced diet (a satisfactory ratio of protein to carbo-hydrate and fat); that is, there is no need to provide them with extra supplies of vitamins, either for laying or, in the case of breeding stock, for fertility. When the grain and meal they get are sound, the feeder need not worry about vitamins, because they will be in sufficient supply. Where, however, the birds are closely confined—which may be the case with pullets during a severe winter—and they are unable to obtain plenty of sunshine and green food it is advisable to provide that which is lacking; and cod-liver oil and dried yeast are probably the most convenient forms. It has also been found beneficial, when the all-mash system of feeding is in vogue, to include in that diet 1 per cent of cod-liver oil, unless that mash is guaranteed to contain a fairly large percentage of the germ of wheat and yellow maize.

The main object in feeding layers is to ensure the greatest number of eggs of commercial value, and so to make a fair profit, no matter whether the stock is being kept as a means of gaining a livelihood or simply as a hobby. Of course, there are many other factors which govern success; but whatever stage is being dealt with—breeding stock, chickens, layers, market birds, or even show specimens—the greatest factor is in the value of the food and the method of feeding. Practical knowledge of the real value of the various grains, meals, etc., which are available is a great asset. Theoretical knowledge of poultry nutrition does not necessarily make one a good feeder. Practical experience is required; and it means feeding with the eye as well as the hand to get the best results. One must be more than a mere grain scatterer to make a success of feeding fowls for egg production.

The Feeding of Layers

So much, then, for the food; there is now the feeding to consider. What amount of food does the hen require to keep her fit and to enable her to produce the necessary quantity of eggs to make the keeping of her a paying proposition? That question is frequently put to me; but each keeper of fowls must settle it for himself. Nothing is to be gained by attempting to treat the fowl as if it were a machine into which a definite amount and quality of fuel can be put to produce a given amount of work. The saying, "What is one man's meat is another man's poison," may be hackneyed, but it is none the less true. To a certain degree, this saying will also apply to poultry feeding. What would answer for one flock or one bird under some conditions would not answer for other fowls under different conditions. The same birds at different times might crave and need widely different foods; and more than one correspondent has complained to me of his stock "hunger striking." For this reason, the most important items to consider are the nature of the accommodation and the season of the year. I have already intimated that fowls which are allowed access to spacious grass runs can, and will, find much meat and vegetables, in the way of worms, insects, grubs, and the like, as well as grass and herbs, so that they can have a wide ration, while those kept in strict confinement generally require a fairly narrow one. But this does not altogether apply to quantity.

It will be obvious to anyone who gives the matter a moment's thought, that the nature of the run must make a difference in the amount of food that has to be given by hand. Nevertheless, even under such ideal conditions as free range, the quantity differs according to the time of the year. I find that fowls, so kept, require less grain and meal during spring and autumn than at other times, but more in winter than in summer, granted normal weather. And they seldom

need as much as birds which are confined to small quarters where there is little, if any, chance of their getting anything in the way of "natural" food.

It is generally considered a very simple matter to feed poultry on a farm; and so it is, at some seasons. Still, even farm poultry will not give satisfactory results unless their attendant keeps his eyes open. There are times when such birds seem to find nearly all they require for upkeep and good production during their rambles, returning to roost at the end

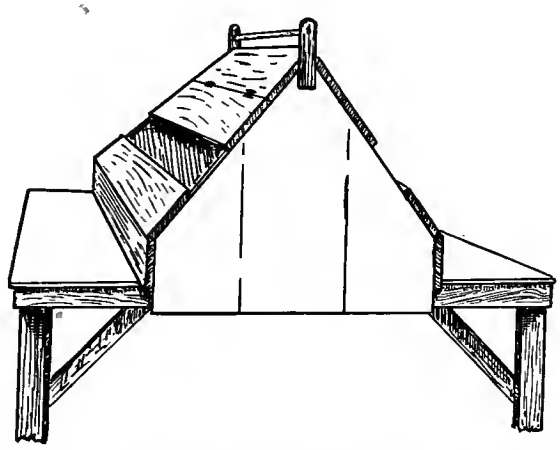


FIG. 145. A LARGE-FLOCK DRY MASH HOPPER
When the flock is a large one, the dry mash hoppers for use indoors should be double-sided, fixed on tables about 2 ft. 6 in. high and between the front windows and the perches. Each should be fitted with a revolving rod to prevent fowls roosting on it

of the day with bulging crops and quite unable to take their evening meal. In such circumstances, one meal *per diem*, half a handful or less of corn at breakfast time, should be ample. It is the same, also, where arable land is available, and the fowls are permitted to follow the plough—they can be kept for a considerable time on practically little hand feeding. Then, again, take the case of poultry which are housed on stubble land, a common practice at many farms. After the corn has been harvested, they will generally find enough grain and other food to keep them healthy and productive for weeks on end.

Nevertheless, not only has care to be exercised at such times to prevent overfeeding the birds and wasting food, but one must see that, when such free supplies come to an end, the short rations which had previously sufficed are not continued. This is especially necessary with the growing stock and with layers; but it is a matter that must not be overlooked even when old birds and moulting fowls are being so kept. Admittedly, when pullets and hens are in full lay, there is very little, if any, difference in the quantity of food they consume, no matter whether they are of the non-sitting or the general-purpose breeds; but it is the amount of grain, etc., which is given to them that has to be studied.

There is no doubt that poultrymen who keep their layers in small quarters have a decided advantage, in that they can, more or less, control the quantity; and this applies whether the layers are being folded or penned in single batteries, or, as so many thousands of fowls are being kept to-day, on the intensive system, confined to a house, or with nothing more than a plain earth run in which to exercise. In such circumstances as these, there is probably an inclination to consider the hen as a laying machine. And yet, those who do so must study her, if they would get the best out of her. Except in the case of battery-kept layers, whose food is all dry mash, the rations almost invariably consist of grain and mash, as far as the solids are concerned, the mash being wet, dry, or in the form of nuts or pellets. Comparatively few poultry-keepers favour the all mash system of feeding fowls which can exercise their limbs; and, after all, exercise is a valuable aid to digestion, as it produces heat.

The Quantity of Grain Required

I am convinced that grain is a necessary part of the layers' diet; and that I am right in my conviction is proved by the fact that the vitamin content of the food is better assured in whole grain than in meal. However, vitamins apart, I have always found that grain-fed fowls, those which get one good meal of it as part of their daily rations, produce better results than those which have nothing but mash, while for free range breeding stock there is no better way of providing them with cereals. The quantity the laying hen requires will generally be found to average about 2 oz. a head *per diem*, in conjunction with mash in some form; and for many years I have advocated it to the thousands who have sought my advice on the feeding of layers in confined quarters.

In this direction, the beginner can carry out a very simple test and gain an excellent idea of the amount of food which should keep his fowls fit and in good production; and it is one that might well be undertaken as soon as the pullets commence to lay. Prepare a quantity of wet mash to any of the formulae already mentioned for layers, and enough of it to extend their crops to the full capacity—say, two heaped-up tablespoonfuls for each bird. When it is ready, get the exact weight or measure of it, put the mash into a trough, and let the fowls eat as much as they like—they will leave the trough when their crops are full. Remove what food remains, and weigh or measure it.

Do likewise with the grain, allowing three handfuls for every two birds. Provide one meal early in the morning and the other in the evening; and

do not omit clean drinking water, fresh green-stuff (around breakfast time), grit, and shell-forming material in separate containers. In each case subtract from the quantities of mash and grain which were provided the amounts which remain; the answer will show just what a given number of pullets can eat. On succeeding days for a week, gradually reduce that allowance—the food they can eat—to about one-half, and watch results. If they eat it steadily and do not appear to be ravenously hungry, let it act as the average; but see that it keeps them energetic and productive. If poultry-nuts take the place of wet mash treat them in a similar way, although in this case it is essential to let the birds get accustomed to this food.

When Changes are made in the Diet

It is, of course, the same whenever an alteration is made in the form of food, as, for instance, when changing from all mash to grain for growers which have been battery-reared, and from wet to dry mash for layers—the change-over must always be a gradual one, and extend over a week or more. With dry mash, admittedly, it is difficult to fix any given quantity; and although when they are used to it, layers seldom take more than they require, some pullets are apt to stand around too much when they first acquire the taste for dry mash. It is for this reason that poultry-keepers who favour the dry system of feeding their layers should let the birds get accustomed to it in their growing stage. If the beginner start his poultry-keeping career by purchasing pullets on the point of lay, he should inquire of the seller as to the system on which the birds have been fed as growers, because a continuance of it is less likely to cause a check than is an abrupt change in the method. As a rule, in addition to the 2 oz. of grain, with fresh green-stuff, water, etc., *ad lib.*, a layer which is not at free range or on a spacious grass run will require 4 oz. of wet mash—that is, the meal already prepared with water —or 2 oz. of poultry-nuts as her daily rations. Such an allowance, if the feeding ratio is correct, should enable her to lay well and keep fit.

In all cases, however, it is advisable to handle the birds once or twice a month. This can be done when they have settled down for the night, and by means of a lantern rather than when there is sufficient light for them to see at all clearly. They can then be taken from the perch without too much fuss, if they are gently handled and not of too excitable a nature. There is no need to examine the lot, if the flock is large; one here and there should be sufficient to ascertain the general condition. Any which may be too heavy, and fat around the stern, or, on the other hand, of light weight and with a keel-bone almost like a blade (instead of being nicely fleshed on each side), should be removed for special treatment—the former for "prison fare" and plenty of exercise, or for table, and the latter for a narrow ration and cod-liver oil, or the fire. It is scarcely possible, and certainly not profitable, to give each layer in a flock her own special diet—if such could be ascertained—but, by handling the birds as suggested, the attendant should be able to determine whether the diet is suitable or not, and make any alterations that are deemed advisable. It will also assist him considerably to find out which are the good and bad layers, when he has mastered the handling of fowls for capacity.

Economy in Feeding

It is perhaps hardly necessary for me to suggest that poultry should always have good quality food, particularly those birds which are producing eggs for consumption. I do not mean by this that only the highest priced corn, meals, laying mashes, etc., are the most suitable for the birds, or, rather, that such alone will produce the best results; but it is often very poor economy to purchase the cheapest. There is, of course, real need for poultry-keepers to feed their birds for results as economically as possible without sacrificing efficiency. Unfortunately, many poultry-keepers regard the matter of feeding economically as meaning the use of foods which are lowest priced, and keeping the food bill to the smallest possible amount a head; but this method is generally as wasteful and as expensive as the other extreme of feeding without any selection of food value or price. Experienced poultrymen consider results before costs, that is, not what it has cost to feed a certain number of birds for the year but what results have been obtained for that cost. Of course, full advantage should be taken of local supplies, and particularly of the less common foods.

Dried brewers' grains and malt culms are obtainable at low rates, and they will help to cheapen the mash, although they should not be used heavily for layers. Some poultry-keepers may be friendly with a local baker and be able to relieve him of any stale bread, which should be cut into rough chunks and baked dry in the oven, afterwards to be pounded and used as "biscuit meal." Bakehouse sweepings are sometimes recommended, but, as with granary sweepings, one should be sure that there is sufficient good food to make the price low, and nothing at all likely to injure the birds in any way. Butchers' meat is nearly always more costly than meat meal or fish meal, especially when one considers the high moisture content of uncooked meat; but sound "trimmings" and other waste can sometimes be obtained for the proverbial "next-to-nothing" price from one's own supplier of joints, while if there is a slaughter-house

in the vicinity it may be possible to get bullock's or sheep's blood which can be cooked and used in the mash in place of other animal matter. However, care has to be exercised in buying these "economic" foods; and it is never wise to buy any simply because it is low-priced. At the same time it is as well to keep a keen look-out for good special lines which may be useful, avoiding anything sour or musty, in grain, meal, or other food.

The best way to study economy in poultry feeding is to prevent waste in any form. It is a mistake to feed vermin or sparrows, finches, and other wild birds; rats or mice in a food shed may cost pounds per annum, and may mean the difference between profit and loss, while encouraging wild birds to mix with the flock at meal times is not likely to ensure the feeder getting full value for the food supplied. Store the food in a dry and airy place; allowing food to get out of fit feeding condition is a very common form of waste. Purchase it in as large quantities as convenient; but do not over-stock and have stale foods (especially meals) on hand. Fresh consignments should not be put on top of the old, as the bins should be thoroughly cleared out each time. Select the foods with care; sometimes a sample of grain is light and full of empty husks, which will be wasted, while meals may be not quite what their name implies.

The poultry-keeper should get to know for himself, and not be afraid of asking questions or returning to the seller any food not up to standard. Fowls should be fed for results, and not by rule of thumb; if the laying stock get just sufficient nourishment to keep them alive and well, food is being wasted because there is no return in the form of eggs—it is the little extra nourishment which means eggs. On the other hand, if the method of feeding is such that the birds become too fat—probably owing to lack of exercise—food is being wasted because they are being put out of condition. It is false economy to cut out one ingredient from the diet simply because it is dear, unless a lower-priced substitute of equal feeding value can be obtained. Full use should be made of kitchen scraps and similar house waste, but such waste should not be made because it can be used in the fowls' food.

When to Vary the Diet

In purveying for layers it is considered to be necessary to give them a judicious variety of food selected from the three general divisions—vegetable, cereal, and animal matter. No doubt variety is good, while there must be a combination of meals, etc., to enable the feeder to get those balanced rations; but it is a great mistake, when keeping fowls for egg production, to be constantly changing their food with the idea of providing them with variety. When the poultry-keeper has found a suitable diet for his birds he will be wise to continue with it as long as they produce plenty of eggs. The best time to make a change is when the hens are beginning to slacken off, either in the number of eggs or the size of them. The careful feeder of poultry knows the requirements of his stock in varying circumstances—during the seasons of the year, at different stages of development, for periods of laying, moulting, sitting, and fattening, and according to the space at command. Under all these conditions fowls require different treatment, as much, too, in the quantity as in the nature of their diet.

Some authorities refer to the science of feeding poultry, but it amounts to nothing more than the knowledge of combining a system with the view to providing the proper quality and quantity so mixed and supplied as to observe every want of the bird in the different circumstances just mentioned. Change is good, and where a large flock is kept it is as well to ring the changes as much as possible according to market prices; but this hardly affects the small poultry-keeper who purchases his food retail. He will be well advised to make as little change as possible when he has found what suits his birds, and merely to alter the diet according to season.

It may be as well to explain why there must be a difference in the diet of layers, for no doubt the novice would think it much simpler to feed his birds exactly the same all the year round. The object of feeding is, or should be, to provide the fowls with all the food they require for maintaining their body in a healthy condition, and that little extra for the manufacture of eggs. It may be taken for granted that the actual egg varies little during the year, with normal feeding; but the point which really matters is the difference in weather conditions and the difference in the time available for feeding. Naturally, during the winter months the birds require more food of a heating nature—which is vastly different from food given in a hot state—while in the summer months such food would result in an overheated state of the blood or a fatty condition, unless production was at a high figure.

The novice may well ask: "Why not make the hens scratch harder in the winter to keep themselves warm?" It is a necessary point in winter feeding that the birds should be kept active during the day; but what about the nights, and long nights at that? It is not much good making the birds scratch hard for an hour with the idea that such exercise will keep them warm during the sixteen hours or so that they have to remain on the perch in a cool atmosphere. It must be remembered that layers cannot don extra clothes in winter or get extra warmth from a fire —heating the hen house during cold weather has been

tried in this country, but it is a sure way of bringing trouble. Therefore, the layers must be supplied with food which will help to maintain bodily warmth.

How to Supply Grain

I have already mentioned that grain, dry mash, wet mash, and poultry-nuts or pellets can be employed in the feeding of layers; so it will be as well if I state how each kind should be given to the birds. Grain may be supplied dry, as it comes from the corn merchant, or boiled. Most poultry-keepers prefer it in the former state, which is certainly wise, if merely because it will then be better from the vitamin point of view; and they scatter it for their birds, which also is a wise proceeding. When grain is placed in a trough it invariably means that the fowls get it with no more exertion than picking it up. This is not enough; and the only times when it should be indulged are when the feeder is ascertaining what quantity of corn his layers can eat, or, yet again, when dry mash fed pullets, which have been battery-reared, are getting accustomed to it. These, nevertheless, are very short periods only. To keep fowls in good health it is necessary to provide some form of exercise every day, the more so in winter than in summer, and particularly when they are confined to house or shed. There is no better means of doing this, when an attractive range is lacking, than to give a certain amount of the food in such a manner as will enforce them to do some work to get it.

It is natural exercise for birds to have to seek their food, scratching aside any litter which covers it; so it is obvious that, in small quarters, to give grain well buried in straw, sandy earth, or other similar light material is good for the health of fowls; the exercise they get in this way promotes warmth, aids digestion, and keeps the internal organs in good order. At first it may be necessary to leave just enough in view to persuade them to search; and yet I have never had occasion to do so, even with young birds which have just acquired the taste for corn, since they know how to work for what they require, and their hunger makes them seek for food. On free range or in grass runs, it is the general plan to scatter the grain broadcast or to put it down in a long thin line. This latter plan I find the better in encouraging the fowls to attend to the matter in hand rather than to get in each other's way, and, also, to discourage visits from sparrows and other small birds. Exercise is beneficial for table fowls, also; at any rate, in my opinion it puts flavour into the flesh. If anyone doubts this, note the comparison between the meat of a young bird which has been active in obtaining its food, and of one which is penned without any exercise; the flesh of the latter never seems to taste as well.

Vigour, both for egg laying and flesh production, depends on something more than simply idling about all day long, with exercise merely at a trough. Therefore, hens and pullets which cannot roam around should work for their grain through some light litter; using their legs and feet in such a way keeps them vigorous and healthy. Boiled grain, even as part of the corn allowance, is more beneficial for fowls which are being fattened or those suffering from crop trouble than for healthy layers and robust breeding stock. Some poultry-keepers give their layers boiled grain with the idea of economizing in the food; less of this swollen grain is required to fill the bird's crop, and, consequently, she is satisfied with the reduced quantity. To provide a fowl with softened grain only will in time deprive the crop and gizzard of their natural functions, and, eventually, result in slack crop and a gizzard which cannot contract on its contents and thus mill the food in a proper manner.

Why Mash is Provided

The idea of using meal in the diet of layers, whether the meal be in the form of wet mash, dry mash, or poultry-nuts (pellets), is to enable the birds to assimilate more nourishment *per diem* than Nature ever intended, so that they may produce more eggs than they would lay if they were running wild. Now, although these nuts or pellets are reasonably hard and retain their shape, they, as well as mash, must be given from troughs. Food in this form must not be buried like grain, to promote exercise, while, obviously, it should not be thrown on the ground, because it would then be readily trampled and fouled. As it is, unless wet mash is properly prepared, and dry mash is put into well-constructed hoppers, some of the food is bound to get on the ground; and it is for this reason that wet mash troughs should be put down in as clean a place as possible, while dry mash hoppers might well be on a platform, so that any spilled mash could be easily removed at the end of the day.

Unfortunately, it is impossible to teach all fowls to eat in a cleanly manner or to eat every particle of food which is given to them. Some will jump into the trough if they get a chance and scatter the food, while others have an annoying habit of sending dry mash in all directions with their beaks, as though searching for some particular item. It is certainly advisable to prepare their mash in such a way that it can be eaten with ease. It requires a little practice to make wet mash for fowls. Too frequently it is placed before them in a state that does not tempt them to eat, and some of it is left in the trough to encourage birds of the air, rats, or similar vermin.

Much that I have written on this particular subject in connexion with the feeding of chickens can be

applied to the feeding of layers. When preparing wet mash the endeavour should be to blend the various ingredients with each other in such a way that none stands out. To be properly made, and to be of real service to fowls, this kind of soft food should be similar to a well-baked loaf of bread, that is, readily broken up but still adhering firmly together when handled. It should be crumbly or friable, so that, if pressed in the hand and then released it will fall apart and not be lumpy, while none of it will adhere to the skin. Wet mash should really be moist mash, because if it approaches a sloppy and sticky mass it will not tempt the fowls to consume it. Mix the food in a bucket, unless large numbers of stock have to be fed, in which case there should be mash tubs set aside for the purpose, or a copper used solely for them.

I have assisted in mixing wet mash on very large wooden trays, using a steel shovel; and I once saw it mixed by machinery for the feeding of two or three thousand laying pullets, whose owner found wet mash much more economical than dry mash. However, whether the flock be large or small, if wet mash is to be palatable, it must be well made. As a rule, the bulk of the meals are soaked with boiling water, left for some minutes to swell, and then dried off by working in the weatings (middlings, etc.) a little at a time, so that it becomes well absorbed and prevents a powdered mass. This, though, is a matter that the feeder must watch, because some fowls eat more of a mash which is just damped than one at all wet. When vegetables and house scraps enter into it, they should be put through a mincing machine or finely chopped, while oddments of meat may be boiled and then minced; but, in any case, the water used for boiling should form part of the mash. All the wet mash that is given to my fowls is mixed with hot water and prepared twelve or more hours before it is placed into the troughs for them.

Some poultry-keepers put boiled wheat into the mash, but I prefer to make it of meals and milling offals, with sound vegetable waste, etc., when available. When dry mash is employed, it is important to see that it contains a good proportion of germ of grain, particularly of wheat and yellow maize, otherwise cod-liver oil will have to be added to make up any deficiency. Dry mash should be bulked with bran and middlings, but it should be free of dust; that is, if a handful of it is put in a very fine sieve and lightly shaken, little of it should fall through, and what does drop should be meal, not useless dust. I have always held that mash should be bulky rather than solid, since, while a bulky mash may contain a high proportion of material which is voided by the birds, undigested, it keeps their internal organs in working condition, and does not put too great a tax on the crop. It is for this reason that I like my fowls to get plenty of fresh young green-stuff, and why I never hesitate to mix in their wet mash any waste from sound vegetables.

In connexion with wet mash feeding, let me impress upon the poultry-keeper the necessity of providing long and narrow receptacles which will permit of the birds getting their food without fighting for a front place—three or four inches a head is not too much—and of heavy enough material to prevent their being upset. Keep them clean; and when they are not in use, hang them in a handy place, so that they cannot be fouled by birds of any kind. Scrape all food from them after each meal—so that there will be nothing to tempt rats. Food should never be left about the floor of the house or run. Dry mash hoppers should be entirely closed up at night, because fowls do not require such food at daybreak in summer, while the attendant should be ready with the birds' first meal at daybreak in winter. Layers will not come to the least harm if they have to wait two or three hours for their breakfast when there are many hours of daylight, because, unless there is any fear of foxes, they will have left their night quarters and be picking around their run, looking for that early worm at such times, while the meal they have had late the previous day will prevent their starving. Very early feeding in summer, as a matter of fact, is not desirable; hence if they get their breakfast at 7 o'clock, that is, a good meal then, it will not interfere with their production.

Which System of Feeding to Adopt

Earlier in this chapter, when dealing with grain, wet mash, etc., certain diets have been suggested; but I want it to be understood that they need not be rigorously adhered to, simply because circumstances alter cases. At the best, they can be taken as a guide; the wise poultry-feeder will adjust matters to suit his own particular case, and he will do it by careful observation. It has been said that individual appetites vary, as doubtless they do; a hen may not consume the same quantity of food at each meal. Likewise, no two flocks will eat the same amount; appetites vary according to different conditions. Granted all this to be true, however, it would be most unwise to attempt to bring the feeding of commercial layers to such a fine point that each hen and pullet had to be fed separately to ensure the best results; it could not possibly be a business proposition.

No matter to what extent it may be desirable to control the birds when one is experimenting in feeding, such experiments rarely, if ever, pay; that is, there is no direct monetary return from them. The great thing is to provide the layers with a well-balanced diet, and to see that they get plenty of it. A hen

which cannot get sufficient of the right kind of food to enable her to produce marketable eggs, ceases to be profitable. She cannot produce that desirable "one egg *per diem*" if given little food. Overfeeding is not understood; fowls can be overfed if they get only two meals daily, or underfed with four. My experience with heavy layers, and especially young hens, is that they must always be generously fed, and that it is hardly possible for them to eat too much of a properly balanced diet, judiciously given. Fowls can stand more heating food in winter than in summer, a greater quantity when re-feathering from their moult than when commencing it, while throughout that period they require more "fuel food" than in the normal laying season.

There is more than one successful method of feeding fowls for egg production. To a large extent, the best to adopt will depend upon the breed and accommodation, and on the convenience of the feeder. Some poultry-keepers can attend to their stock at practically any hour of the day, while others, especially when the numbers of fowls are small, have to work at something else for a living and can attend to their birds in the mornings and evenings only, with extra time on high days and holidays. Therefore, the feeder should adopt a system which best suits him.

Grain and Wet Mash

One reliable way of feeding layers is to give them grain and wet mash; another, grain and dry mash; a third, grain and poultry-nuts (pellets); a fourth, nothing but dry mash; and a fifth, grain, dry mash, and wet mash. Here, then, are five different methods of feeding fowls for egg production; yet each is successful in capable hands. The first, grain and wet mash, can be supplied in three distinct ways, viz. wet mash for breakfast and grain for the tea-time meal; the reverse; and grain first and last, but wet mash at noon. The first of these mentioned, the wet mash breakfast, was in use long before I was old enough to distinguish a cock from a hen, and for many years afterwards, too; while there are still those who keep fowls—and get good results from them—who continue on such lines. In my early days, it was the custom to provide laying fowls with a hot breakfast in winter; and I have myself taken mash straight out of a copper and dumped it, steaming hot, into the troughs.

However, when I commenced keeping fowls of my own, I broke away from that system, as I had discovered that grain kept the birds busy and gave rather better results. At any rate, I experimented with half rations of mash, and bran mash at that, for breakfast, with a generous allowance of corn in the scratching shed about an hour afterwards. Then I gradually omitted the mash, and let the birds begin the day with corn and finish it with wet mash. And that is the method I have followed for many years now when feeding pullets which are kept on the semi-intensive system for egg production during late autumn and winter, when the days draw in. Grain given in the morning induces them to work, and that is good for them; a full meal of mash is too apt to make them sit around, and idle fowls are likely to become liverish or too fat. Grain for breakfast keeps them busy during the coldest part of the day; and they have the benefit of good light, thus ensuring practically every morsel being found, the litter being thoroughly scratched over in the search for food.

Those who keep pullets of the general-purpose type, the "heavies," may find it beneficial to divide the daily allowance of grain between the breakfast and midday meals, the stipulated quantity being scattered over the litter each time. Thus the fowl, which at free range invariably hunts for food during the morning and rests for an hour or two around midday, can be induced to work at noon and rest between meals. This dividing of the grain ration is certainly an incentive to the birds taking the maximum amount of exercise; because they do not get a cropful at either meal they keep longer at work. Moreover, it is a safe plan to adopt with pullets which are not in full lay or those which have not commenced laying. Such birds require watching, because if they do not eat their afternoon wet mash with a relish, the midday half ration of grain might well be omitted for the time being. It is always safe to reckon that at least 50 per cent of the daily rations of layers should be soft food. However, in any case under this system, the fowls will require wet mash as the last meal of the day; and no matter which class of layer is being fed, the mash should be a generous meal in winter. It may mean that the troughs have to be down for a quarter of an hour or so; but, even with two half rations of grain, I find that few good layers are slow feeders, and, as a rule, the food is eaten and the troughs ready for putting away in ten minutes at the outside.

This is certainly an excellent way of feeding layers in winter, when time can be found to prepare wet mash. The full meal of nourishing and easily digested soft food they get just before going to roost seems to keep them contented on the perches, so that when they come down in the morning they are rested and fit for work. The scratching exercise warms them and assists in keeping their productive organs in working order. Discussing this method, a fellow poultry-keeper quite recently assured me that, throughout the winter months, he gives his pullets mash for breakfast and grain in the afternoon, as it enables them to get two full meals and keeps egg production up to the maximum. His fowls are housed in Sussex

night arks and kept in large grass runs with little shelter.

Another variation of the grain and wet mash system is to provide the birds with the former, in half rations, for breakfast and just before roosting time, and the soft food at midday. The last meal of the day is put in full view of the pullets, that is, none of it is buried in the litter, although thrown on it; the wet mash, of course, is put into a trough, and it is restricted to one heaped-up tablespoonful for each bird. If the wet mash is properly made it digests in sufficient time to ensure the fowls being ready for the second meal of grain before they retire for the day. However, when I tried this system I kept the breakfast allowance of grain to less than 1 oz. a head, gave the pullets their wet mash between 11 and 11.30 a.m., and put the grain (generally averaging 1½ oz. for each bird) into a trough at least half an hour before they went to roost. The birds were Leghorns which had practically free range; and they almost invariably had a scratch around between their last meal and turning in for the night. All these systems, I might point out, are for winter feeding, since at other times of the year the order is generally wet mash for breakfast and grain in the afternoon.

Dry Mash and Poultry-nuts

The second method, viz. grain and dry mash, consists of dividing the former as the breakfast and afternoon meals, and allowing the layers to get dry mash at any time of the day. This I have found more suitable for the very active non-sitting breeds than the general-purpose kinds, particularly if the latter are verging on "heavies." Unless the birds have been dry-mash reared, that is, unless they have become accustomed to this form of mash in their growing stage, some difficulty will be experienced at first in getting them to eat sufficient to nourish them. This is a point which requires attention, otherwise the birds will rely on the grain only. If the poultry-keeper is starting off with pullets on the point of laying he should ascertain from the seller on what system they have been reared, so that he can continue with it, if desirable. That is, if for instance the birds have been brought along on grain and wet mash, keep to that way of feeding them for egg production, until they have become thoroughly settled down in their new quarters. Suddenly to alter the mode of feeding is very apt to put pullets back; the change of surroundings is generally as much as they can stand.

The third way of feeding layers is with grain and poultry-nuts; and these nuts, like wet mash, can be given at various times of the day to suit the convenience of the feeder. Here are three ways in which I have supplied my fowls with poultry-nuts: (1) Breakfast, 1 oz. a head of grain buried in the litter; midday, 2 oz. of nuts put into a trough; last meal, 1 oz. of grain in troughs. (2) Breakfast and the last meal as above; nuts available in dry mash hoppers at any time of the day. (3) Breakfast, 1½ oz. a head of nuts from a trough and ¼ oz. of grain buried in the litter to encourage the birds to exercise; last meal, 1¾ oz. of grain from a trough; dry mash in hoppers always available. If inconvenient to provide the fowls with

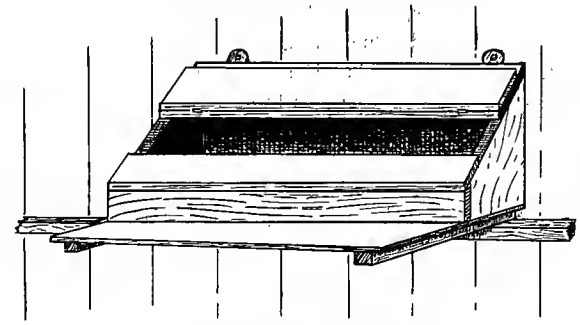


FIG. 146. A WALL HOPPER

A dry mash hopper for half a dozen fowls can be made to hang against the wall of the house, about 3 ft. from the floor. A suitable size would be 2 ft. long by 1 ft. wide—with a 1 ft. wide platform—4 in. high in front, and 1 ft. 6 in. at the back. The "lip" and the opening could be 5 in. wide

dry mash, increase the quantity of nuts to 2 oz. for each bird at breakfast time, supply them with ½ oz. of grain at midday for exercise, and keep the last meal to 1½ oz.; or, should they be on free range and housed in Sussex night arks, let them have 2 oz. of nuts for breakfast, and 2 oz. of grain at their tea-time meal. I might here remark that it is not a difficult matter to change from mash to nuts. It must, of course, be done gradually. On the first day place a few of the nuts on top of the wet or dry mash; and on successive days increase the quantity of nuts, at the same time reducing the quantity of mash, and spread this process of changing over a period of at least a week when replacing dry mash and a fortnight in the case of wet mash.

All-mash feeding, that is, providing the layers with dry mash to the exclusion of wet mash, grain, and poultry-nuts, is by no means popular in this country, and especially for layers which are kept where they can exercise their legs. It is the method adopted by those who keep their hens in single batteries; but I have never seen it in vogue otherwise, whether the fowls are at free range, in confined grass runs, or on the intensive system. Compared with wet mash, dry mash may well be described as slow feeding, in that it takes much longer to digest; hence, unless the dry mash mixture is considerably concentrated—which is not advisable, in my opinion—or the birds are fed by artificial light, they can scarcely take sufficient food

during the few hours of daylight in winter to nourish them and ensure good egg production. It is certainly not a method I would recommend for the novice, at any rate for winter feeding, although it might prove successful during summer. Dry feeding, that is, all dry mash, involves less labour; but, both the birds and the food troughs or mash hoppers require attention. The former must end the day with full crops, while the latter must permit a constant supply of food in the trough, that is, the dry mash must flow easily from the hopper, which it will not do if it gets at all damp. The food, also, must be kept out of the reach of rats and wild birds. Moreover, it must always be fresh enough to ensure the layers taking sufficient of it for bodily upkeep and egg production.

Feeding by Artificial Light

The last method of feeding layers is by a combination of grain, wet mash, and dry mash; and this is generally adopted when the birds are fed by artificial light during the winter months. To endeavour to get from their laying pullets the maximum production throughout that period of high prices, the feeding of such birds by artificial light has of recent times become the vogue among commercial egg farmers, although it can be undertaken by anyone, even by a man who is keeping but a score of pullets. In some cases where this method is adopted the light is switched on in the evening, in others during the early hours of the morning; but it matters little which way is followed, because as soon as the layers become accustomed to it, they will leave their perches to feed, hence it amounts to the same in the end.

The great idea is to induce the birds to take full egg rations; that is, to eat as much food in winter as they could consume in summer, or rather as large a quantity as they require at the height of the normal laying season. A bird which lays heavily can scarcely be overfed, provided she has a balanced diet and one which does not contain too large a proportion of fibre. Under artificial lighting she will have to get four meals during the twenty-four hours; and that is where the amateur is likely to fail. He will probably attempt to ply his pullets with larger meals than they can reasonably digest; and thus they will eventually eat less than they should do for heavy production. There must be an extra quantity of food beyond the usual summer egg ration, because it is the amount required to provide the layers with extra warmth and energy, and which invariably prevents that worrying neck moult. It does not mean a very considerable extra quantity, and certainly not double the usual daily allowance, as some poultry-keepers appear to imagine.

Unless one is working on a large scale and has pullets of varying ages to manage, results obtained from this method of feeding may not justify the extra labour it involves. When matured pullets of a guaranteed laying strain are being dealt with, not only will production be high enough but the laying season will be of sufficient duration, without artificial light. Where it is highly beneficial is in managing early-hatched pullets which have been laying for some weeks, as well as summer pullets which are not sufficiently advanced, and young hens recovering from their moult. The extra food which such birds are able to eat is of considerable assistance in preventing neck-moulting among the earliest-hatched pullets, and in increasing the energy and staying powers of the others. It encourages the development of the ovary and keeps up body weight.

It is of course essential to use a light which will shine on the food troughs and the perches. Electric lamps fitted with dimmers are undoubtedly the best labour-savers; but a petrol lamp or an up-to-date hurricane lantern will prove handy enough for small houses. Lamps which are clocked on and off are ideal; but there are comparatively few who adopt feeding by artificial light who can have their laying houses so fitted, while the expense is justified only when it is carried out on a very large scale. As it is, one can scarcely wire movable poultry houses; and there are farms, such as the one on which I am keeping my poultry at present, where oil is the only means of artificial lighting. This, nevertheless, will answer well enough for houses in which small numbers of layers are kept. It is necessary to use a clear light and preferably one which can be dimmed.

When feeding stock under this system, the most important point to observe is to give the fowls their meals regularly, that is, to keep to the same hours and foods each day, and particularly not to alter the time of lighting up. Considerable patience must be exercised in getting the birds accustomed to feeding by artificial light. Abrupt changes of any kind are never good for pullets; and it is especially necessary to be careful when getting them used to the artificial light. Even if they were reared artificially and were in the habit of having a night meal or two as chickens, they will have forgotten it long before they reach the laying stage. It will not be so difficult if the pullets have been accustomed to an occasional evening visit from their attendant for the purpose of noting their condition in the growing stages and weeding out any which may not be progressing in a satisfactory manner.

The Extra Meal at Night

For a week prior to the date set for the commencement of a daily meal by artificial light, he should enter each house about the time he fixes for that meal, and stay around for five to ten minutes with the light on

full. He need not be idle, because handling the pullets always tends to make them tame. At any rate, a week of such extra labour will not be wasted; and, as it will be carried out from about the middle of September to the end of January, he can do it at night. As a matter of fact, unless the lights are worked automatically, it will be found much more convenient to light up at night in preference to the very early morning. There is little sense in being out before daybreak to attend to poultry, although one has to rise early when horses have to be got ready for the day's work in winter. Birds which require a meal by artificial light should get a late supper rather than a very early breakfast; and that is the system I strongly recommend, as it does not upset the usual winter routine for other stock.

The first meal could be given at 7 to 8 o'clock, according to daybreak, and consist of grain, the allowance averaging about 1 oz. a head. The birds will be off their perches and ready for it; so the corn can be scattered over the litter, and if the litter is of the right kind and not permitted to get matted, that quantity of food will keep them working for quite a long time. At 10 o'clock the dry mash hopper should be opened for the day, care being taken to run one's fingers through the meal in the trough and to see that the hopper is not clogged. At 2 p.m. wet mash should be put down for them in troughs; and on fine days this meal should be given outside the house. The quantity will average about 3 oz. a head when the meals, etc., are prepared with water. It must not be a full meal, not as much as the layers will eat when they have wet mash as their last meal of the day. Time should be allowed for the birds to eat the whole of it before dusk and to have a pick around the run before they go to roost. It is advisable to close the dry mash hopper when the wet mash is put down. At 8 p.m. light them up for their last meal, and let it be grain. The allowance should be 1½ oz. to 2 oz. a head according to requirements, and given from a trough this time, not scattered. Drinking water must always be available inside the houses.

At the commencement, the light will probably be required for about an hour, because the fowls must finish their meal and return to their perches before they are left in the dark again. The whole system of night feeding requires patience. When pullets become thoroughly accustomed to it they will not be a great deal of trouble; and seldom have I found it necessary to put any of the birds on to the perch again. Sometimes this happens at the beginning, because no matter how much care is taken in selecting the layers and making them comfortable, there is generally a "fool bird" in each flock—the one which wants to scratch around although her crop is full of grain, or which would sleep under the droppings' board rather than on the perch.

When properly managed, however, night feeding generally results in heavy laying; and, provided prices do not slump, the extra eggs obtained from the stock should more than compensate the feeder for his extra expense. Some authorities assert that the very pick of the pullets, those birds which have been hatched in early spring from pedigree laying strains, should be so fed; but I have never yet found it necessary to do so, as I feel sure it would result in overstimulation and eventually cause the layers to go out of production and into a moult. A winter moult is not unknown in such circumstances; and when that occurs, feeding by artificial light certainly does not pay. I have tried it out thoroughly on a large scale with late-hatched White Leghorns and winter-hatched White Wyandottes, using electric light; and in each case it proved successful. It increased rather than saved labour, because, although the whole of the houses were lit up automatically from dim to full and back to dim and then darkness, each was visited to see that the fowls were getting their food and not keeping to the perches. Admittedly it was a profitable undertaking, as eggs were in good demand and prices high; but for the past year or so, there has been a rather higher rate of profit in autumn and early winter eggs than in eggs produced in winter only. During a normal season, however, it might well be worth while to subject some of the layers to night feeding. The sole object is the maximum egg output without interfering with the health of the birds.

The Object in View

Although the artificial lighting of poultry houses has been in use for many years, there is still some misapprehension regarding the purpose for which it is adopted in connexion with egg production. With certain classes of pullets, as I have mentioned, it increases the egg yield in the winter season; but this does not necessarily mean that it materially adds to the total output of any bird for the year, since what is gained in winter with the aid of lighting would possibly be lost at some other period of the pullet's first season. Nevertheless, the lower production would reasonably occur in springtime, when table eggs are so plentiful as to be cheap; so that is scarcely worth taking into account, simply because the extra eggs would be laid when the highest prices prevailed. There is no doubt that, when this system has failed, it is generally owing to the mistake of selecting the wrong class of bird for the treatment. It must be properly used and not abused. It can be practised beneficially on young hens—second-season pullets as they are frequently termed—as well as very

early-hatched or late-hatched pullets in their first season, but only in special circumstances.

By such means, for instance, young hens could be brought quickly through their moult and back into lay again while high prices still prevailed. It would prevent any check in the production of early-hatched pullets which had commenced laying in summer, and it would undoubtedly delay their moult until the season of high prices had passed. The late-hatched or summer pullets could be greatly improved by a night meal when the hours of daylight begin to be curtailed, provided they are of a size and weight to respond to heavy feeding—it would be wasted on other than normally grown chickens, in this latter case. Care must be taken right through the period when artificial lighting is in vogue to watch the birds and be guided by observations—if there is over-production and loss of body weight it might be advisable to dispense with the evening meal for the time, granted the diet being well balanced. A twelve-hour feeding day is as beneficial for layers in winter as in summer; and it enables them to sleep long enough to recuperate. The idea of using artificial light for an extra meal is to give the layers the chance of getting, in addition to their ordinary winter rations, the amount of food they would pick up at free range during the natural laying season of spring and summer.

With regard to lighting the laying houses, where electric current is available, the gas-filled type of lamp is preferable to the vacuum lamp, since it produces a white light and uses half the amount of current to give an illumination of the same candle power. Although an excess of light is inadvisable, it is difficult to say precisely what candle-power is necessary to light efficiently a given area of a laying house floor. Much will depend on the manner in which the light is diffused and reflected—a suitable reflector, as most people are aware, improves the illumination. The most satisfactory way to ascertain it is to experiment in one section of a house before fixing the whole of the light points and deciding on the candle-power of the lamps. The light must be intense enough to illuminate the house, with most of the rays deflected on the feeding places but the perches partly shaded. A height of 6 ft. from the floor should suffice; but shades or deflectors—aluminium paint is beneficial—must be fitted, while a thin board hung from the ceiling will shade the perches.

One 30-watt gas-filled electric bulb should be ample to light a house 10 ft. by 16 ft., i.e. 160 sq. ft. of floor space, probably more than that; and lamps fixed 16 ft. to 20 ft. apart in large modern laying houses, each light point in the centre between the front perch and the front of the house, should enable the birds with ease to see the food and find their way back to the perches. Two 40-watt lamps, similar to the above, have answered in a 20-ft. square house (400 sq. ft. of floor space) when fitted 10 ft. apart. When used for lighting, the lamps will have to be dimmed, perhaps at the beginning to arouse the birds, but certainly at the end of the feeding hour, to indicate to them the time for retiring to their perches. Where electricity is not available, paraffin or petrol lamps can be used, while in some cases ordinary hurricane lanterns will be suitable if fitted with a good deflector. There are also special lamps for the purpose on the market, and some of them hold just enough oil to last a given time and then to become gradually dim. When the layers have become accustomed to night feeding, they will leave their perches and consume the extra meal as part of their day's work—it becomes a habit.

The Moulting of Layers

One phase which is frequently overlooked in the management of layers is the moult; and yet it has a most important bearing on production. It is because of the moult and the general cessation of laying that egg prices tend to rise in autumn. In the natural course of events, second-season pullets—the birds are actually hens at the time—moult in August and September, and, with very few exceptions, they do not lay during that period. Just how long they are out of production depends to a large extent upon the manner in which they are managed. Moulting is neither an ailment nor a disease, since all adult stock must pass through it once a year. It is a natural process; but a little extra care exercised when the feathers begin to drop will ensure the birds getting furnished again as quickly as possible. The moulters nearly always have less attention than the layers or other stock; and yet it is difficult to see why, unless it is that the birds' actual appearance does not appeal to their owners. Nevertheless, it is quite as important to give the moulters sufficient care as it is to attend to growing chickens, because if the young hens are worth keeping at all it is as well to realize that insufficient attention may mean an extra month or more of non-production, or even the loss of the birds altogether.

As a general rule, it is advisable to lower the feeding somewhat during the dropping of the old feathers, so as to ensure that production has ceased. This, however, must be decided by the condition of the birds, because, if they are already reduced below normal weight, any considerable curtailment of their rations would result in their falling into a state of debility which would be disastrous, especially if the fowls were required for late winter laying or the early breeding pens. As soon as the new feathers have

started to grow is the time to feed the moulters liberally, even more so then than if they were actually in lay, because feather growing requires extra nourishment, and the birds should be built up at this stage. For this purpose they should get full allowances of wet mash for breakfast, and grain in the afternoon, while dry mash should be available between those two meals; and there should be no shortage of clean drinking water, with abundance of fresh green food for birds kept in small runs. The wet mash should consist of meals, etc., in the following proportions: best middlings 28 lb., maize meal 14 lb., Sussex-ground oats 10½ lb., bran 7 lb., pea meal, soya bean meal, and cut green bone (or meat-and-bone meal) 3½ lb. of each, and 1 per cent (practically 12 oz. or three-quarters of a pint) of cod-liver oil.

Some feeders include in the mash 5 per cent of linseed meal (or jelly made from boiled linseed) and 4 oz. of flowers of sulphur; but I prefer to incorporate them with salt—by boiling 1 lb. of whole linseed in a quantity of water until a thick mucilage results, and then stirring in two tablespoonfuls of flowers of sulphur and a similar quantity of salt, mixing the whole thoroughly together—and add a tablespoonful of it, twice weekly, to the mash for a dozen or so hens. The dry mash can be composed of three parts each best middlings and bran, one and a half parts each Sussex-ground oats and yellow maize meal, and half a part fish meal, all by weight, while the grain should consist of three measures of wheat, two of clipped oats, and one measure of kibbled maize.

Summer *v.* Autumn Moulters

Whether it is advisable to encourage layers to moult in summer, to prepare them for late autumn production, is a matter on which opinions differ. It is the general belief that, all things being equal, the inferior layer moults earliest; that is, young hens which moult early are nothing like as good producers as those which moult late. And yet hens which do not commence their moult until October or later often take about twelve weeks to get through. Some authorities assert that hens which show complete new feathers by 1st September are early moulters, and should, therefore, be culled as poor producers, because they moult slowly and remain out of production for a considerable period. It is true that, generally speaking, autumn moulters moult comparatively quickly, in that all their feathers come off almost at once; but it is certainly not my experience that such birds feather up again almost immediately and get back to production within a month, because unless they are very carefully tended they are apt to catch a chill.

On the other hand, early moulting yearling hens, or second-season pullets as they are then, which have been out of production during July and August and are in form again by 1st September, can be very valuable and profitable producers when in charge of anyone who understands the feeding of layers. Autumn eggs, particularly from hens, fetch a price which is well worth getting by the producer. When eggs are scarce and dear, in autumn, the early moulted birds are again laying, and producing eggs which, because of their size and weight, bring the top price. There is the fear, perhaps, that these hens will finish production in December; and that is probably the reason for suggesting that they should be disposed of in August. Such disposal may be advisable if layers are to be kept for one season only; but it has yet to be proved to my satisfaction that good layers should be dispensed with at the end of their first year of production.

Good layers can moult early. When they do so it is at a time when the cost of feeding is at the lowest, and eggs, too, are not fetching much of a price. Given free range then, and short rations of grain only, they will moult easily and store up sufficient energy to form a basis for heavy feeding. Young hens, which are furnished up again by 1st September, can be brought into lay for autumn eggs and kept laying steadily throughout winter and spring. Late moulters are a source of anxiety, especially if the weather changes suddenly, as it so frequently does in autumn. Hens which are through their moult by the beginning of September are, in capable hands, able to stay the pace of heavy feeding for winter production, and are fit to stand the weather. In these respects they are equal to well reared pullets; and they lay first-grade eggs. Such, at any rate, is my experience with general-purpose breeds bred for laying, and, too, with sex-linked and first-cross hens.

It may not be so with light breeds; these birds are generally such great producers as a rule that a long season may take it out of them, and result in a prolonged moult. It is not my experience that, with hens kept under the same conditions, the heavy producers, in spite of their late moult, start laying again (after the moult) at the same time as those which moult early. Neither do I find that early moulters, after laying a batch of eggs in the autumn, will moult in winter and not come back into production until the following spring, when eggs are plentiful and cheap. It is certainly not so in the hands of an experienced feeder. Commercial egg farmers, who have contracts to fill all through the year, know that production must be kept up in winter, and not only from pullets but from hens. Consequently every available layer is utilized, and thus early moulters are not scrapped as useless.

Encouraging Hens to Moult

As it is, utility poultry-keepers generally are beginning to realize that it is beneficial to encourage young hens to moult; and in this they are merely adopting the method which has been in vogue for many years among expert rearers of market chickens in the south-eastern counties of England, and, too, of exhibitors of poultry who have their adult birds moulted through and ready for the autumn events, as well as cute buyers of "bird" hens from pheasant rearers. It may be novel to force laying hens to moult early; but it is a common practice with those who rear chickens for the early markets, with fanciers who have teams of birds for the autumn and winter exhibitions, and with buyers of hens which have been used for pheasant rearing and are required for the brooding of ducklings in winter.

Hens can be definitely encouraged to moult by adopting special management; and yearling birds which are being held over for a profitable second year's production should certainly be brought into moult in summer. They must, of course, be of good stock, that is, bred for production; and, moreover, they should be kept on free range. This is essential for success, since it is next to useless attempting such treatment with fowls of poor breeding. With the right class of stock, however, it is possible to get them off lay and in moult during the period of low egg prices, and to have them begin laying again in autumn when eggs are usually selling at prices which should be profitable to the producer.

At the beginning of June the over-year pullets should be removed from their usual quarters and put on range, with roosting accommodation in Sussex night arks or slatted floor houses. Their diet should be reduced by omitting from it all soft food, that is, wet or dry mash; they should get grain only, a mixture of wheat and clipped oats, and seldom more than 2 oz. a head *per diem*. This, together with what they will find while ranging, should be their sole food until the beginning of August. They can then be brought on to full rations and returned to their winter quarters, where they should have the layers' diet and be fed by artificial light as soon as the days draw in. These birds will require very careful attention all through, because they must not be allowed to get into too low a condition while they are moulting and re-furnishing. However, granted such attention, the hens should moult easily and be in hard condition for a long spell of laying. They will certainly be out of production for two months or so; but during that time they will, with good management, be building up sufficient reserve to enable them to produce the maximum during the peak period, or, on the other hand, to ensure early and strong eggs for hatching should it be desired to breed from them. This is not what I term forcing a moult, but encouraging it; and it amounts to no more than giving the birds their freedom, with enough food to keep them healthy while out of production. They will return to normal body weight when the moult is over, if they get the food already suggested for moulters.

Forcing a Moult

Forcing a moult is a method employed for single birds or small pens, and is certainly not advisable for large flocks. At any rate, I have never tried it for the early moulting of young hens which are required for heavy production, although it will answer well enough for show stock. It consists of confining the fowls to their house for a week or more, until their feathers are falling freely, and then restricting them to small quarters, where they will be warm, sheltered, and dry. Their food during the first week can be bran mash, or the usual grain allowance of wheat and oats divided into two meals and scattered over the litter. When the birds are corn fed they should get Epsom salts in their drinking water on the first two days, as much as a level teaspoonful to a quart; after which, water may be restricted to hasten the process. As soon as the new feathers are observed, full moulting rations should be given, and the birds permitted to eat as much as they like of grain and dry mash.

It will be obvious that, to stand such drastic treatment, the fowls must be in good body condition at the start. It is not a method I should employ, or recommend, for young hens which are kept solely for egg production, simply because I imagine it would be difficult to prevent their dropping into a second moult after a couple of months of prolific production. The free range method is decidedly preferable, although longer, since it ensures the birds getting thoroughly hard, and being as fit as well-reared young pullets which are coming into lay for the first time. The great point about hens is that there is no loss from the production of small eggs.

Culling the Stock

Then there is the matter of culling the laying stock. This means going through the birds periodically to remove from the flock any which are not very productive. If it were possible to subject the whole of our layers to trap-nests from the day they commence as pullets, the records which would of necessity be taken of their performances would enable us to set aside, for killing, all birds which did not come up to expectations. But since trap-nesting is impracticable when commercial egg farming is being undertaken—al-

though absolutely essential for the pedigree breeder—the birds are culled according to their appearance and handling. These are matters with which I have fully dealt in Chapter IV, when treating of the selection of the breeding stock. The unproductive bird is a liability, and her removal from the flock is a necessity. Nevertheless, while it is comparatively easy to detect fowls which show signs of weakness or lack of vitality, it is somewhat difficult for the beginner to distinguish between good and mediocre layers, until he has mastered the handling of the producers.

The spring is a particularly opportune time to cull adult stock, because there is then a reasonably good chance of disposing of, at a good price for market, any which are not laying satisfactorily. The head is one of the most important points to observe; in a good layer the comb and wattles are well developed and bright red, and the eyes prominent, clear, and red-brown. The plumage should be closely carried, and be glossy, and the pelvic bones supple and well apart. Some poultry-keepers upset their birds considerably while culling the flock, by chasing them into crates or special coops. I prefer to handle them when they are on the perches and by the aid of a lantern.

It is as well, when managing layers, not to be in too great a hurry to blame the birds if all is not as it should be, because in the vast majority of cases it is due to some fault of the attendant—poor food, a badly-balanced ration, irregular feeding or cleaning, lack of fresh air, shortage of water supply, and a host of other causes can be thought of and checked before arriving at the conclusion that the birds are the culprits. Red mite will upset the best calculations; and many a poultry-keeper never attempts to look for such pests because he prides himself on keeping the house clean. Yet they hide almost anywhere, and sometimes appear in spite of the best precautions—they will be noticed when they have multiplied to such an extent as to spoil the birds' plumage, but a comparatively small number of them will interfere with egg production.

Check everything up if the feeding appears to be correct; try some of the other causes, and if nothing wrong can be found in that direction get back to the food and see that there is sufficient fish or meat in the diet to encourage a good output. Even if the feeder is certain that there is, let him try an additional 2½ per cent and note the results. Often, just a little more animal protein will be responded to by the birds if they are in good fettle. On the other hand, should they be thin, use more maize meal and less Sussex-ground oats in the mash. Check up the quality of the foods; the ingredients may be in correct proportions, but the quality of some of them low, and in this case the whole will be affected. Truly, anyone can feed fowls; but the feeding of layers for big egg production requires practice, keen observation, and the exercise of common sense. One has to study the condition of the stock and the birds' requirements during the varying seasons. It is only by constant attention that layers will be payers.

A Handy Feeding Table for the Different Systems

As a guide for the novice, but solely as such, because cast-iron rules can never be made for the feeding of layers, the following table should be of assistance, as it covers the several systems under which fowls are kept for egg production. The weights mentioned are for the average daily rations of a laying hen.

FREE RANGE

Season	Morning	Midday	Afternoon
Summer	1 oz. wet mash	—	1½–2 oz. grain
Winter	1 oz. grain	4 oz. wet mash	1½ oz. grain
During severe weather	2 oz. grain	—	4 oz. wet mash

INTENSIVE OR SEMI-INTENSIVE

Season	Morning	Midday	Afternoon
Summer	1 oz. grain	3 oz. wet mash	1 oz. grain
Winter	1 oz. grain, or 1 oz. grain	1 oz. grain (dry mash all day)	4 oz. wet mash 2 oz. grain

When night feeding is being undertaken—
8 a.m., 1 oz. grain; 10 a.m., dry mash; 2 p.m., 3 oz. wet mash; 8 p.m. 1½ oz. to 2 oz. grain.

FOLD

Season	Morning	Midday	Evening
Summer	1½ oz. grain	(dry mash from 10 a.m.)	
Winter	1 oz. grain	(dry mash all day)	1 oz. grain

BATTERY

Dry mash all day, and every day throughout the year.

For any of the foregoing, poultry-nuts can take the place of wet mash, or, under the fold system, they can be given instead of grain. The actual quantities must vary according to circumstances. For instance, free range fowls may require only 1 oz. a head of grain during some days in summer when they return to their house for a meal in the afternoon, having found sufficient food during their rambles to keep them vigorous and in full lay. On the other hand, they may need more than 4 oz. of wet mash before going to roost in winter. Those kept intensively or semi-intensively may not eat 3 oz. of wet mash at midday in summer, and yet they may look for more than 4 oz. of wet mash for the afternoon meal in winter. Some fowls which are folded thrive well on grain only in summer, while they may benefit by an occasional meal of wet mash in winter. The only way to get the best out of the laying stock is to handle the birds regularly, and feed accordingly.

The Necessary Utensils

I have mentioned the utensils which are necessary for the actual feeding of the stock—long, narrow wooden troughs for the wet mash, and hoppers for the dry mash, the grain, when not scattered in the runs or raked into the litter, being put into the mash troughs. There will be drinking vessels also, and perhaps a box or a container of some sort for grit and shell. In addition to them there will have to be buckets or pails for carrying the corn and wet mash, and probably tubs in which to prepare the latter. Pails are cheap enough these days; and I prefer galvanized to so-called enamel buckets. There is really no necessity to go in for heavy galvanized pails such as one uses in the dairy, because the lighter the vessel the less burden is it to do the food round. Granted these days one can get hand trollies with pneumatic tyres; but for the average flocks buckets or pails are probably handy enough.

Watering cans will also be required, unless one is adept with a pail for filling the drinking vessels; and even with water laid on at different parts, and a water "barrow" in use, a can comes in very handy. If it were not for the time required to fill cans from the tap, and the many journeys they necessitate when the stock is numerous, I should use nothing else. A 20-gallon water carrier, even only two-thirds full, is an awkward appliance to push or pull when the going is rough, no matter how easily it can be manipulated on the flat; but our fields are not bowling greens. However, no matter what vessels are in use for food and water, make a point of keeping them clean. And observe cleanliness in the layers' houses and haunts.

CHAPTER IX

THE BREEDS OF FOWL AND THEIR CHARACTERISTICS

CONCERNING the domestic fowl (*Gallus domesticus*), the layman who takes his cue from the dictionary is accustomed to regard cocks and hens merely as articles of food, birds which are reared for the table and, in the case of the female species, kept for the production of eggs. Except that some fowls are black, and others white, red or variegated, all are alike to him—just "chicken." It will probably surprise him to learn, therefore, that in this country alone over fifty distinct breeds of fowl—exclusive of bantams, ducks, geese, and turkeys—are cultivated extensively for their useful qualities or for exhibition. Such a number is tabulated in "The Poultry Club Standard of Perfection," which is the authority on poultry in Great Britain and Northern Ireland. In addition to these, there are also several breeds for which no provision is made in that publication, and which are known as non-standard breeds. These latter may be sufficiently pure bred to merit a local name, but they are not recognized as such by any body of specialist breeders or by the Poultry Club. Consequently, when pure breeds are referred to in poultry circles it almost invariably means those for which there are standards.

As a matter of fact, though, it is becoming well-nigh essential nowadays to designate them as standard-bred birds, if for no other reason than to distinguish them from some which bear similar names, but which are bred solely for high egg production and without any attention being paid to their external characteristics. This is being brought about not merely owing to the custom of late years of providing sections at poultry shows for "exhibition" and "utility" fowls, but because, when endeavouring to get high fecund stocks, egg production is the aim to the exclusion of standard shape, colour, markings, and other points. Admittedly, of quite recent times, there is a desire among some breeders so to amend the standards for certain breeds which are popular that indications of productiveness can be included in the descriptions; but since it has been proved very conclusively that there is not a set laying type for each breed, it is difficult to understand how this can be accomplished.

The Origin of Fowls

In a universal reference book recently published, it is stated that our domestic fowls "descend from the red Jungle fowl, a common game-bird in India and south-east Asia generally, which frequents woodland country, roosting in the trees at night, and during the rainy seasons frequenting them by day as well; and as it does not go far up the mountains it never inhabits a cold climate." I think it was Darwin who held similar views, viz. that all modern breeds of fowl were the offspring of a common ancestor; and he would probably have considered the differences between the slow-moving Cochin and the sprightly Campine to have been brought about by the conditions of domestication, and particularly selection and mating.

Now, the period at which the fowl was first domesticated is lost in obscurity. As poultry have been found domesticated in widely different localities, among peoples having no communication with each other and even in islands in the South Seas—which must have been cut off from communication with the mainland for vast periods of time—it is evident that their domestication took place in the very earliest days, and that there was a natural fearlessness and a desire for man's companionship on the part of the fowl which marked it out as especially adapted to be his servant and purveyor. That fowls existed before the Noachic flood appears to be established beyond doubt; and it is quite evident that they were in such great request in Egypt, at the earliest time at which a faithful history is preserved, that their eggs were hatched artificially. This is known on the authority of Diodorus Siculus, an historian who lived about half a century before the birth of Christ, that is, nearly 2000 years ago.

There are records of the regard paid by the Grecians to domestic fowls at a period of more than four centuries earlier than that; and by them poultry were considered as particularly under the guardianship of Mars, their god of war. They were offered to him in sacrifice, and are so mentioned by Aristophanes, who flourished 430 B.C. Columella, who lived about the year 50 of the Christian era, gave very full particulars concerning the Roman fowls and their management. This authority said that "the females of the poultry yard are properly called hens (*gallina*), the males cocks (*galli*), and the half-males capons (*capi*)"; and he also noted that "the profit arising from these fowls is not despicable, if skill be employed in bringing them up." When Julius Caesar invaded Britain about 55 B.C., he found that, although their religion would not permit the inhabitants to eat fowls, they kept them for pleasure—in all probability for cock-fighting.

Likely enough the Phœnicians brought them to Britain when they came for tin.

Certain races of the wild *galli* have been commonly regarded as the forefathers of our poultry yard, and these are as follows: (*a*) The *Gallus giganteus* of Temmsinek, an inhabitant of the islands of the Eastern Archipelago and parts of the adjacent continent, particularly the Malay of to-day; (*b*) the Bengal jungle fowl, somewhat similar to the Black-Breasted Red Game fowl, but having a white face like the now almost extinct Spanish fowl; (*c*) the Sonnerat jungle fowl (known also as the *Gallus Stanley*), something like a Duckwing Game; (*d*) the *Gallus furcatus*, or the fork-tailed jungle fowl; (*e*) the *Gallus aeneus*, the bronze jungle fowl; and (*f*) the *Gallus Bankiva*, the smallest of all, and similar to the Black-Red Game. That many of our present breeds of fowl may have been derived from the four species, such as *Gallus giganteus*, *G. furcatus*, *G. Sonneratii*, and *G. Bankiva*, there is every probability; but they are not necessarily to be regarded as the sole ancestors. The bird which Darwin believed to be the probable ancestor of the domestic hen was *Gallus Bankiva*, which is still to be found in the jungles of Burma, Northern India, Siam, and Sumatra.

As I have remarked, this particular jungle fowl closely resembles our present-day Black-Red Game in the colour and markings of its plumage; but the female is nearer what poultry authorities term a partridge than a wheaten. The birds are active, and in size almost up to Pit Game, although not so small as Game bantams; and specimens of them are to be seen at the London Zoological Gardens. And yet, a pair of birds labelled "*Gallus Bankiva* (Indian Jungle Fowl)" which were exhibited in the live-stock (India) section of the 4th World's Poultry Congress at the Crystal Palace, London, in July, 1930, were what could be more correctly termed Malay, and altogether different from those fowls at the Zoological Gardens. However, considering that the crow of the male is not unlike that of the common barnyard cock—although somewhat short rather than prolonged—that the females cackle in the accustomed way after laying, that the breed can be easily crossed with domestic fowls, producing fertile offspring, and that they are themselves readily domesticated, it would certainly appear that *Gallus Bankiva* is one of the ancestors of the hen. Nevertheless, these indications do not prove that this was the only ancestor of the modern fowl, or that it was necessarily a progenitor of all breeds of fowl. That the *Gallus giganteus* or Malay fowl, which was domesticated over 3000 years ago, had much to do with the origin of the largest of our breeds, such as the Brahma, the Cochin, and the Langshan—all of which came to England from the Far East—there is no doubt in my mind. There are so many differences in structure and habits between the light and non-sitting breeds and the large, heavy, soft-feathered breeds that it is difficult to see how all were descended from the *Gallus Bankiva*, even by selection.

Increased Egg Production

Under domestication the fowl has been increased in size, its productive powers have been vastly improved, and its broodiness has, to a large extent, been decreased; but, on the other hand, it has lost much of its stamina. In the ordinary course, i.e. running wild, the jungle fowl would produce no more than sufficient eggs to form one clutch in the season, or at most two clutches; that is, the female would lay enough for one or two nests, and she would sit on the eggs and rear the chicks. During the period of production she would probably not exceed two dozen eggs; but such a total for a domestic hen would ensure her being killed as useless at the end of her first season, even if she were allowed to live as long as that. Attention in the way of housing and feeding, and selection of the breeding stock, have, of course, resulted in vast improvements; and in all modern breeds there is a very considerable increase in production. No doubt the frequent collection of the eggs had much to do with it in the beginning. While this may not be apparent to all, I have found it answer even to-day with game birds; and when turkeys are kept on the general farm, where they are almost invariably permitted to make their own nesting places in secluded spots, it is customary for the attendant to remove the first few eggs of each clutch they produce, with the object of encouraging the hens to lay many more than they would require to form nests on which to sit. However, it is with the breeds as they now exist that I intend to deal in this chapter; hence there is no necessity for me to say more about the origin and domestication of the fowl.

The whole of the pure breeds of poultry which are exhibited in this country to-day are standardized; that is, each has its detailed description which has been agreed to by specialist breeders and the Poultry Club, and to which the birds are bred, shown, and judged. In that book ("The Poultry Club Standard of Perfection") the breeds are mentioned in lexicographical order rather than according to their countries of origin; and, except that each is given as a sitter or a non-sitter, the only division made in them is "light" and "heavy." There is no reference to their utility properties; and this is simply because such points cannot be standardized, while, obviously, none is marked as merely ornamental or as fit for the pit or cock-fighting. Excluding bantams, there are

really few purely ornamental breeds; but the breeding of Pit Game is still a speciality and considered as a very important section of poultry culture in many parts of the world. Still, as cock-fighting is illegal in Great Britain, I shall not deal with the breeding of Game cocks.

The Light Breeds

Those which are included in this group are known as non-sitters, and, as a rule, they produce white-shelled eggs. At no stage of their career are they supposed to fall broody and sit on eggs for the purpose of incubating them. Hence they should produce, as they generally do produce, large quantities of eggs. Occasionally, however, broodiness—which, after all, is a natural sequence of laying—overcomes them, so that they sit closely on the nest and go through all the antics of the "clucking" hen. Rarely, nevertheless, are they used for the purpose, not only because they do not cover a large batch of eggs, but they are very apt to get particularly nervous during their sitting period and thus prove unsuitable mothers for any chicks they may hatch out. I have sometimes used them for sitting, when they have fallen broody in summer, because the close confinement helps them to moult easily; but they are not altogether satisfactory mothers, being difficult to handle. Consequently, pullets of the light or non-sitting breeds which show the slightest sign of broodiness should be immediately removed from the laying quarters and put into a special coop to be brought into production again. If they are allowed to sit closely on the usual nest for even a couple of days, by being overlooked, it will take at least a month to bring them back into lay.

They are, first and foremost, egg breeds; that is, their greatest usefulness lies in the production of eggs. And to such an extent has heavy production been developed in the most popular kinds that one rarely finds a strain of really poor layers among them. They are of comparatively small build, but the male birds should scale 6 lb. and females 5 lb. They are close-feathered, very active on the leg and wing, and decidedly hardy; and probably the only point not in their favour is an inclination to nervousness. They are great foragers when given the opportunity, ranging freely over fields and thus obtaining large quantities of natural food, both animal and vegetable, which assists considerably in production and, of course, results in nourishing eggs. In such circumstances they can be kept at a low cost for feeding during many months of the year.

The light and non-sitting breeds are also great flyers, easily scaling an 8 ft. wire-netting fence, if they have sufficient room for taking off. Because of this, it is imperative to subject them to wing clipping when they have to be confined to small open runs, unless those runs are topped with garden netting. Wing clipping, however, is a very simple and painless operation, and consists merely of the cutting, with scissors, of the seven or so longest feathers of one wing—and one wing only, not both wings—to within a couple of inches of the skin. If the wing is spread open, the feathers to remove (the flights) are those

FIG. 147. WING CLIPPING

When clipping a fowl's wing to prevent flying, I hold the bird over my left knee, its head under my arm, and can thus work quickly, single-handed. Five of the flight feathers have already been removed from the pullet shown above, and the others are in process of being cut

farthest from the body. Some pullets will positively scream during the process, even though the cutting is as painless as the trimming of one's own finger nails.

The birds are, admittedly, of an excitable temperament and very easily startled; but they can be tamed to eat out of one's hand, and particularly when they are reared in small numbers in back-garden runs. Otherwise, especially on a wide range, they are inclined to be "scarey." Another point in favour of non-sitters, however, is that they feather up quickly as chickens, while the pullets reach the laying stage a month or more ahead of pullets of other breeds. The birds are not in great demand for table purposes; neither are they profitable as such, although some breeds in this class are useful for the production of table chickens, while there is a fair quantity of meat on them when sold as old hens, if they have been heavily fed. The cockerels, however, are much too active to put on fat, even when coop fed, and they cannot be subjected to the cramming process. So, with very few exceptions, poultrymen do not go in for light breeds for market.

At one time they were considered to be unsuitable for winter laying; but breeders of them are realizing that a larger-bodied and more vigorous type of bird than has become so general of recent years is desirable.

Hence, it will be found that pullets which are hatched from strong stock in the spring, properly reared through their growing stage, and then housed on the semi-intensive system, will lay well during the winter months when given adequate attention. To such an extent have they been improved for winter production that many commercial egg farmers select birds of this class for laying all through the year, despite the fact that their eggs generally are white-shelled. Although brown-shelled eggs are favoured in this country—they are supposed to be "richer" than others, which is not actually the case—pure white eggs are always readily saleable at good prices; and, granted the pullets are well furnished before they commence to lay, size of egg is well up to standard requirements. As it is, at commercial egg farms in this country there are probably more light than heavy birds kept for laying.

According to the Poultry Club ruling, for exhibition, the light breeds are as follows: Ancona, Andalusian, Aseel, Bresse, Buttercup, Campine, Coveney White, Flowerbird, Hamburgh, Houdan, Lakenfelder, Leghorn, Minorca, Old English Game, Old English Pheasant (fowl), Poland, Redcap, Scots Dumpy, Scots Grey, Silkie, Spanish, Sultan, Sumatra Game, Welsummer, and Yokohama. Among the foregoing, however, there are those which are decidedly sitters and producers of brown or tinted eggs, while some of them are fit to be classed as heavy rather than light, according to their standard weights. In the exhibition pen, nevertheless, there are only two sections, viz. "light" and "heavy."

The Heavy Breeds

Breeds which are in the heavy group include those known as "general-purpose" or "dual-purpose" fowls, and those termed "meat" breeds or table birds. The former title is given to breeds which are very useful for the production of eggs, as well as being suitable for table, while the females are sitters and lay brown or tinted eggs. The "meat" breeds are primarily market fowls, since their laying powers amount to little, compared with the non-sitters. Originally, the general-purpose kinds were not considered as possessing qualities of outstanding merit; that is, they were not among the best laying breeds for numbers of eggs, nor were they, as table birds, fit for the best markets. They were, as indeed most of them are to-day, business fowls, suitable for the vast majority of farmers and others who require, in one breed, laying pullets and saleable cockerels, thus obviating the keeping of one kind solely for egg production and another for market chickens. They are stocky and sturdy fowls, not as long-legged as the non-sitters, of a more contented and docile disposition than the others, not so likely to use their wings although keen foragers, even the heaviest of them, and scaling not less than 7 lb. for the males and 6 lb. for the females. The hens and pullets become broody at least once a year; and they prove excellent sitters and careful mothers, and are very easy to handle. They are also steady winter layers (of brown or tinted eggs), provided they are hatched at the right season, while they can stand up to rough weather and are not so liable to frost-bite in winter owing to the smallness of their combs and wattles and their rather more profuse feathering.

Of recent times some of the general-purpose breeds have been developed along laying lines, while endeavours have been made to eliminate their brooding propensities. Where success has been achieved in this direction it has almost invariably been at the expense of table properties. Hence, laying strains of these breeds are seldom suitable for the production of market chickens, although by no means difficult to dispose of for other than the top trade in table fowls, when properly fed and finished. On the other hand, there does not appear to be as keen a demand as formerly for large birds for the markets; and, as a result of this, what may be termed the "meat" breeds are not so extensively bred. This falling off is said to be due to various causes, such as small families, small incomes, small appetites, small ovens, and so forth. And yet, when I keep even the largest and heaviest of table breeds, and not merely for market either, I find that any surplus cockerels among those raised on the farm meet with a ready sale, while such birds are particularly serviceable in my own household, as we find little use for 2 lb. table chickens.

The "heavy" breeds classified by the Poultry Club are as follows: Australorp, Barnevelder, Brahma, Cochin, Creve-Cœur, Croad Langshan, Dorking, Essex (Golden), Faverolles, Fleche, Frizzle, Game (Modern), Indian Game, Jersey Giant, Jubilee Game, Langshan, Malay, Malines, Marsh Daisy, Norfolk Grey, Orloff, Orpington, Plymouth Rock, Rhode Island Red, Sussex, Wyandotte, and Wyndham Black. Here again, as in the other class, there are a few breeds which may be said to be out of place, in that some of them are non-sitters and producers of white-shelled eggs, while others are of weights as low as some of the "light" breeds. The standard weights for fully-matured birds of both groups vary as follows: "Light," males 5 lb. to 8 lb., females 4 lb. to 7 lb.; "Heavy," males 6 lb. to 14 lb., females 5 lb. to 11 lb.

The Utility of Ornamental Breeds

The two sections just considered, as I have remarked, are for birds which are exhibited and judged to standard. At one time it was customary for poultry authorities to divide the breeds into three

groups according to the utility properties they possessed; and thus they were classified as layers, general-purpose birds, or market fowls. It is scarcely possible to do so nowadays because, while practically the whole of the light (non-sitting) breeds would have been considered purely as layers, there are among them now three or four breeds which are quite useful for the production of table chickens, notably the Bresse, the Campine, and the Houdan, and possibly the Minorca. In addition to this, several pedigree breeders of the "heavies" have so improved their own strains of birds for egg production that their pullets, in the public competition of the laying tests, have put up records for numbers and size of eggs which have equalled the best results obtained from the egg breeds. Also, I know from practical experience that some of the breeds grouped as general-purpose ones —and especially the Orpington and the Sussex—are not surpassed for table fowls by breeds which are considered solely as market birds. It would be by no means difficult for me to separate the breeds into those which, according to some authorities, are purely ornamental, and those which combine beauty with utility, but it would serve no useful purpose. There are really very few purely ornamental breeds; as a matter of fact, there is practically no breed of fowl kept in this country to-day which is so ornamental as to be entirely devoid of usefulness, because the prettiest fowl ever bred could be eaten—or, if too tough, made into "chicken broth"—when its show career ended.

To revert to the "light" and "heavy" groups for a few moments, it is maintained by some breeders and advocates of the former that these non-sitters consume less food for an equal return in average production of eggs than the best of the general-purpose breeds. If that were actually the case, it would be a great advantage for those poultry-keepers who go in for layers; and there would be very little demand for general-purpose breeds. However, this will not be found to be so in practice. There are times when the light breeds may appear to require more food than the "heavies" to keep them in production; but my experience is that, at the height of the laying season —or, at any rate, when pullets are producing the maximum of eggs throughout the winter months— there is practically no difference between the quantity of food that is consumed by each kind. Layers must be heavily fed for heavy production in winter; and this applies no matter to which class they belong, or whether they are pure bred or sex-linked birds.

CLASSIFICATION OF STANDARD BREEDS

Considering the standard breeds according to their country or locality of origin, they are as follows: *English*—Dorking, Essex, Coveney, Indian (Cornish) Game, Marsh Daisy, Modern and Old English Game, Langshan, Norfolk Grey, Old English Pheasant, Orpington, Redcap, Sussex, and Wyndham; *Scottish*—Dumpy and Grey; *American*—Jersey Giant, Plymouth Rock, Rhode Island Red, and Wyandotte; *Asiatic*—Aseel, Brahma, Cochin, Frizzle, Croad Langshan, Malay, Silkie, Sumatra Game, and Yokohama; *Mediterranean*—embracing (the Italian group) Ancona, Buttercup, Flowerbird, Leghorn, and Poland; and (the Spanish group) Andalusian, Minorca, and Spanish (white-faced black); *French*—Bresse, Creve-Cœur, Faverolles, Fleche, and Houdan; *Belgian*—Campine and Malines; *Dutch*—Barnevelder, Hamburgh, and Welsummer; *German*—Lakenfelder; *Russian*—Orloff; *Turkish*—Sultan. There are other breeds; and mention will be made of them towards the end of this chapter.

Now, comparing poultry-keeping of thirty years or so ago with the present day, it is remarkable what a large percentage of those who do go in for fowls are interested in pure breeds, rather than the common barnyard stock. I find an increasing demand for information on the subject, even among those who keep utility stock, since, while they may not be enamoured of the fine points of colour and markings demanded in the Standard for exhibition birds, they like to have some idea of what the different breeds look like, so that they can distinguish between them. The beginner who would be well versed in the exact points of show birds should make a close study of "The Poultry Club Standard of Perfection," and draw a comparison with the specimens which are awarded prizes at the most important exhibitions of the season, and particularly with those on view at the several specialist breed clubs' annual events. However, the descriptions which follow will, I feel sure, prove of great service to him, and, with the illustrations, be of valuable assistance in selecting the numerous breeds and varieties of fowl. They will also give him an excellent idea of the value of each breed from the utility aspect.

During the many years I have specialized in poultry, most breeds have been through my hands, because I have seldom been without one kind or the other, and have acted as a judge of such stock for close on forty years. Wherever possible, in dealing with each breed, I have given its history. There are people, admittedly, who would not give the traditional brass farthing for such knowledge. But to some of us it is always interesting and instructive to trace the history of the various breeds of domestic poultry. By knowing

which kinds were used in the make-up, there is a possibility of utilizing one or more of them with the "made" breed, should the latter at any time fall behindhand in vigour, production, or some other point. This is decidedly better than attempting to improve any of these shortcomings by outcrossing with an entirely foreign breed.

A Wide Range of Patterns

Perhaps the most difficult part the novice will have to master when considering fowls as bred for standard colours and markings will be to distinguish between them. In this matter there is a fairly wide range of patterns; and, candidly, the names given to them are apt to confuse the beginner. Thus, taking them in alphabetical order, there are the following: barred, birchen, black, black-red, blue, blue-red, brassy-wing, bright red, brown, brown-red, buff, buff-laced, chamois, cinnamon, clay, columbian, creole, crow-wing, cuckoo, dark, duckwing, dun, fawn, gold, grey, jubilee, laced, light, mahogany, mottled, partridge, pencilled, pile, red, salmon, silver, silver-grey, spangled, splashed, tipped, wheaten, and white. These are, as I say, colours and markings. The confusing part comes in when, for instance, it is found that the brown (Leghorn and Sussex) and the partridge (Cochin, Plymouth Rock, and Wyandotte) are practically black-red, while the hens of these varieties differ considerably in their actual colours and markings; and although the Black-Red Old English Game females are known as partridge, those of the bright-red variety of this breed—the male of which is very similar to the black-red—are wheaten, clay, and blue-tailed wheaten. Then, too, the columbian (Plymouth Rock and Wyandotte) and the light (Brahma and Sussex) are identical in their plumage colours and markings.

On the other hand, the Dark Brahma and the Dark Dorking are vastly different, both in colour and markings, although the Dark Dorking is often called the Coloured Dorking. The blue, also, may be self-coloured (of one tint), or laced with black, or each feather edged with a darker shade of blue than the ground colour. Then, again, while the Campine is a barred breed, that being the pattern of the markings on its plumage, the Hamburgh hen which is similarly marked is known as a pencilled, yet the pencilling of the Dark Brahma, Partridge Cochin, and Silver-Grey Dorking hens follows the outline of the feathers, somewhat similar in formation to the lacing (double) of the Barnevelder and the Indian Game hens. Clay, also, is merely a darker or harder tone of wheaten, and is sometimes called cinnamon. Mahogany (in the Orloff) is described as "rich dark mahogany uniformly peppered with black" in the female, but the colour and marking of the male are practically those of the black-red variety of fowl. Moreover, there was no difference between the jubilee (Orpington, now practically extinct) and the speckled (Sussex) as regards colours and markings; but the former differed very considerably from the Jubilee Game, which is, in effect, a white-laced buff, and known by poultrymen in America as the White-Laced Red Cornish fowl, because the Indian Game was originated in Cornwall.

How to Deal with "Sports"

In the descriptions which follow, the points enumerated in the different breeds are for the perfect bird according to standard. The novice must not imagine, however, that all fowls breed true to their standard, or that all standard-bred birds produce none but perfect specimens, no matter whether the standard be for purely exhibition stock, for egg-producers, or for table poultry. There must always be a certain percentage of faulty progeny—low, admittedly, from the most carefully mated pens—while occasionally there will be "sports." But, although such fowls as these may be true bred, that is, bred in line or pedigree-bred from pure specimens of their race, it does not follow that they are consequently entitled to their family (breed) name. Let me give two or three examples to make this matter plain to the beginner. A bird which has been bred from Rhode Island Reds, but whose matured plumage is a decided yellow or buff and not red, should not be sold as a Rhode Island Red, since that bird is a buff; so, as there are no Rhode Island Buffs, the faulty-coloured specimen must be discarded as a cull. Then, too, the white sport of a Black Orpington is, obviously, not a Black Orpington. True, it is an Orpington, also a white fowl; but, although there is a white variety of the Orpington, this white sport would be known in poultry circles as a black-bred white.

In another direction, no one has any right to sell or dispose of a single-combed sport from White Wyandottes as a White Wyandotte, simply because the Wyandotte is a rose-combed and not a single-combed breed. All sports should be kept at home or killed for the table; and the same applies to very faulty coloured specimens. To send such birds about the country as representative specimens of their respective races is not justifiable. It is not fair to the beginner, since it is only such as he who is likely to be deceived in this respect. There must always be culls from every mating; but when they are so faulty as to be almost unrecognizable then they should be honestly sold for killing only. I know well enough that faulty colour of the plumage or the wrong type of comb does not affect the laying qualities of a bird —one of my best layers was a single-combed sport

from Gold-Spangled Hamburghs. But, unless the poultry-keeper has a vast knowledge of breeding and can mate those birds to advantage, he should not sell them under their breed name.

I mention these few items to put the novice on his guard against accepting "sports" and very faulty specimens as the genuine article. On the other hand, he must not imagine that the most perfect specimens of their respective breeds are so plentiful that they can be picked up for a mere song. If it is his intention to go in for standard-bred stock he cannot do better than place himself in the hands of breeders of repute, the vast majority of whom are always willing to assist beginners in selecting suitable birds.

In connexion with standards I quote the following from the introduction I wrote for the Poultry Club's publication—

> A standard of perfection is a fixed ideal representing the consensus of practical opinion. . . . The particulars given in each case represent the ideal bird which breeders should strive to produce in as high a degree as possible, but always keeping within reason and not breeding any point to excess. In the "Scale of Points" the relative value of the characteristics is shown by figures; but how many of them shall be deducted for faults in varying degrees must be left to the judge's discretion.

It is from these "Scales of Points," each of which totals up to 100, that the novice ascertains which are the most salient features for exhibition of the different breeds.

The Ancona (Non-sitter)

The Ancona belongs to the Mediterranean group, while the general shape of its body, the type of its comb, its non-sitting propensities and laying qualities mark it as a member of the Spanish tribe. When first known in this country—seventy years or more ago—it was not hailed as a distinct breed. It originated in "accidental sports" from crossing Black and White Minorcas; consequently, stated some poultry authorities, it could not be pure-bred! It is worth noting that in the early seventies the plumage was of a cuckoo character; hence, black-and-white (splashed) fowls exhibited as Anconas—as, indeed, were some brown and red almost like Black-Red Game—were condemned as mongrels, with "no claim to the title of a distinct breed."

In my early days there was a great prejudice among the doyens of the Fancy against new breeds. Anyone having the temerity to "make" a breed had to pass through the acid. Fortunately, or otherwise, things have changed since then; albeit, I wonder what would happen now if some bold spirit were to attempt increasing the Ancona family or even breeding the original cuckoo. However, the Ancona has thoroughly proved itself to be a pure breed; and as such it was long ago admitted to the Poultry Club Standard.

General Characteristics. The breed is in the light and non-sitting class, hence its body is compact and somewhat small, though the back is moderately long and the bearing upright, bold and active. The head is fine and intelligent, with prominent eyes, smooth

FIG. 148. AN ANCONA COCKEREL

face, long and fine wattles, and rather small almond-shaped ear-lobes. The neck is long and profusely covered with hackle, while the legs are of medium length, neither stumpy nor "stilty," with slim bones and toes (four) and shanks and feet free of feathers. The cock's tail is full-sickled and carried well out, while the hen's is inclined to be "whipped"; that is, the feathers are not spread out like a fan but practically folded over each other.

In the original Ancona the comb is single, carried upright in the cock, and drooping over either side of the hen's face with a single fold, but allowing her to see clearly. The other type, the rose comb, lies flat across the head and tapers to a long point behind with a downward curve, not straight or up. When fully matured the male bird weighs about 6 lb. and the hen 5 lb., although the Poultry Club Standard allows up to 6½ lb. and 5½ lb. respectively, which, in my opinion, is on the heavy side for non-sitters.

Varieties, Colour, and Markings. There is only one variety, as it is a black-and-white fowl, but rose-combed as well as single-combed. The general colour of the plumage is bright green-black (beetle-green) relieved by pure white tippings. The markings should

be V-shaped, not in the form of lacing, spangling, splashing, or mottling, but tipping; that is all. The feathers should be black to the roots—the under-colour is black—and only the tips white. The comb, face, and wattles are red, the ear-lobes white, the eyes orange-red, the beak not wholly yellow, but that colour shaded with black or horn, and the legs and feet yellow mottled with black.

Utility Properties. The Ancona makes no claim to be a table fowl. Although surplus cockerels when three to four months old make good eating as the flesh is succulent and the bones are small, there is not enough of it to go round a family. It is as a layer that the breed excels. Granted careful selection in this latter direction, comparatively few pullets fail to give a good account of themselves. They produce large white-shelled eggs, and are hardy to a degree. The chickens are very precocious and "feather up" at an early age.

The birds are good rangers, but are equally at home in confined runs, while the adults are eminently suited to the backyard. Pullets hatched from 1st March to mid-April, even into May, and kept on the semi-intensive system from September onwards, are likely to produce sufficient winter eggs to make them very profitable. I have had June-hatched birds which commenced to lay well before Christmas, and turning out eggs almost daily. But spring-hatched pullets, which are allowed to come along without any special feeding, can generally be depended on to be in full production when top prices prevail. The Ancona is a breed I can thoroughly recommend for the small poultry-keeper.

Standard Requirements. The most important features of the Ancona are the colours and markings of the plumage, for which the total is 35 per cent. Thus the black in the surface colour of the bird must have a rich green sheen, the tippings be free from any streaks of black, and these markings be as regular as possible. Head points rank next in importance with 25 per cent, and then follow type and carriage, 15 per cent, general texture 10 per cent, leg colour, condition, and size 5 per cent each.

The Andalusian (Non-sitter)

Very few of the present generation of poultry-keepers are probably aware of the fact that the Andalusian is among the oldest of our breeds of domestic fowl. Yet, so it is; and the first importations of it are said to have been made from Andalusia, in Spain, in 1851, from a Spanish trader who landed at Portsmouth in that year. In its very early days the breed was sometimes referred to as the Blue Spanish, probably because it was blue-plumaged and came from Spain. But some strains of it no doubt had genuine Spanish blood in them, since at least two breeders "crossed them with white-faced Black Spanish in order to improve the variety."

Evidently, like most new breeds, there was room for improvement because, even though one enthusiastic breeder of them declared—*vide* Wingfield and

Fig. 149. An Andalusian Cock

Johnson's "Poultry Book," published in 1853—that some of the pullets produced "eggs of 3½ oz. in weight at a very early age," the plumage was by no means set. This authority mentioned as important that the colour of the cock should be blue-grey or dove, each feather being lightly margined with a dark tint, with "glossy, velvety, black" hackles. But another, in the edition of Moubray's treatise on "Domestic and Ornamental Poultry," published in 1854, referred to it as the Grey or Speckled Spanish.

The Greys, he said, include "various shades, from a grizzly or streaky white or black to a slatey or smoky dun colour, and are also spotted or speckled," although "the most admired have a slatey blue plumage . . . the feathers on the breast are edged with dark shading or marginated, but not speckled." He referred to the Andalusian solely as a "sub-variety" of the Black

Spanish, declared that the white face and other points of this latter breed were present, and that, very likely, it was the result of accidental or cross breeding, "there being nothing indicating them to possess any permanence of character."

Even the late Lewis Wright (one of the greatest authorities of his day on standard poultry) said that originally it was a "cross-bred sport, born of white and black mixed." Nevertheless, this statement was controverted; and one writer wanted to know if anyone had actually produced "the peculiar slate blue of the Andalusian from crossing white with black birds of any other variety." That was in 1889; and the fancier who made that statement—a well-known exhibitor in my early days—said that the breed was a distinct one, the original birds being more in shape and head points like the Game than the Minorca, while "the newer type now in fashion" was a sort of Grey Minorca. So much for its origin. Some of us know how the Blue Orpington was produced, originally from Blacks and Whites, and mixed up with Cuckoos and Spangles. Hence, while perhaps the colour of the heavy breed may not equal that of the Andalusian, one can imagine that Lewis Wright's statement was not far off the mark.

General Characteristics. Belonging to the Mediterranean group, the breed is a non-sitter, that is, classed as a light. Like the Ancona, it is one of the Spanish races and of sturdier build than the Italian; but it should not be as heavy as the Minorca, nor as square-shouldered. The cock's body is long, fairly broad across the shoulders, and full fronted, his carriage being upright and sprightly, and his plumage close and compact. His wings are large and long, but carried well up, that is, close to his body, and the points hidden by the saddle feathers. His tail is full, the sickles nicely arched and carried boldly, but not so upright as to be termed "squirrel." His legs are long and fairly slim, the toes (four) straight, thin, and well spread, and, like the shanks, free of feather. The thighs must show strength without coarseness.

The general appearance of the cock's head is said to be "large and deep" and inclined to width. As befits an intelligent and sprightly fowl, the head is not mean, certainly; but it is not too large compared with the body. The eyes are large and full. The face is smooth, and the comb single and upright, of medium size and deeply serrated, the back of it inclined to follow the downward curve of the skull, but not touching the neck. Almond-shaped lobes are required, of medium size, smooth and fitting closely to the face; and to match them the wattles should be rather long and thin, well rounded at the bottom and without folds. The neck is long and is furnished with a long and flowing hackle, that is, long rather than short feathers. Some fanciers describe it as being "carried well back"; but, of course, the carriage depends upon the bird's stance.

Except that the hen's comb falls with a single fold to one side of her face and is apt to interfere with the bird's sight, her general characteristics are similar to those of the cock, allowing for the natural sexual differences. When fully matured the male bird should weigh, according to standard, from 7 lb. to 8 lb., and the hen from 5 lb. to 6 lb. Such weights, however, are excessive. The Andalusian is not as heavy as the Minorca.

Variety, Colour, and Markings. Although there has been mention at different times of Black, White, and Pile Andalusians, the breed is a single variety one, viz. Blue. Admittedly, some folk even to-day refer to it as "The Blue Andalusian"—as others will persist in calling the Aylesbury Duck "The White Aylesbury." However, no other colour than blue is recognized by breeders, exhibitors and judges of the Andalusian fowl, while only one type of comb, single, is permitted. The colour of the plumage, as indicated, is blue, but not a self blue, since the Andalusian is a laced breed. Thus, then, the ground colour should be "clear blue" and, except on the hackles and sickles, each feather must be edged with distinct black lacing, but not too narrow. The cock's sickles are dark (without markings) or even black, while the hackles are black with a rich gloss, although a very deep purple is not objectionable as long as the hackles are free of rust, gold, brown, or red. The hen's hackle may be lustrous black or a very dark shade of blue. The feathers at the base of her neck show broad lacing, but on the upper part (of the neck) and the head black alone is seen. It is important that the body lacing is clear and distinct, each feather having a margin of black. Slate-blue is generally the colour of the ground. The beak of both male and female may be dark slate or horn, the eyes red or red-brown (bright and sparkling) and the legs and feet dark slate or black, but the ear-lobes must be white, and the comb, face and wattles the brilliant red of a healthy bird.

Utility Properties. At one time, as I have shown, Andalusian pullets produced 3½ oz. eggs at a very early age. When the breed was being popularized in this country, fifty or more years back, it had utility properties which were really valuable. As egg producers Andalusians were quite equal to, if not above, the average of their Mediterranean sisters, while for table, although hardly ranking as table fowls on account of their size, they were not to be despised. One breeder of Andalusians, in those days, had some April-hatched pullets, which from 1st August to the following 31st July, produced an average of over 234

eggs a bird. Another classed them among the most prolific egg producers; and, taking the weight as well as number of eggs, he doubted if they were equalled by any other breed. This authority said that the weight of eggs per dozen from hens in their second year invariably reached 2 lb., while in some birds the total was considerably above 200 per annum.

Earlier than that, in 1856, one hen which commenced laying in January put up a record of 220 eggs by the end of the same year. From all accounts, however, the average was not far short of 200, and the breed was established as a layer. Forty years ago this was recognized; and at that time an old friend of mine, a veteran poultry-breeder, who specialized in the Andalusian, gave a few words of advice to beginners. "Do not sacrifice the present good laying qualities of this breed," he said, "for the sake of feather. Rather try the utmost to combine the two, or else in a short time, as in the case of other breeds, feather and marking will be their only merits." The chickens were hardy and precocious. In many instances pullets produced their first egg before attaining the age of four months, while cockerels dressed up to 5 lb. when fed for the table, with white and juicy flesh of a delicate flavour.

Andalusians in those days were good in all ways, and could be successfully kept under almost any conditions. They would bear the closest confinement and make themselves happy in the garden of the surburban villa, or the outhouse or small pen of the cottager. For ranging the farmyard they had no superior, finding much of their food and laying well, the cost of their maintenance being the merest trifle. Farmers were advised to run Andalusian cockerels with their mongrel stock to improve the laying qualities of the progeny. But, despite all these excellent utility properties the breed is by no means in the front rank to-day. That veteran's advice has gone unheeded, and few, if any, poultry-keepers would specialize in the Andalusian for laying.

True, there is a specialist club for the breed. At a recent show held at the Crystal Palace, the two classes provided for it resulted in thirteen entries of cocks, any age, and eleven of hens, although at the Dairy Show the same year there were only seven cockerels and nine pullets. For exhibition purposes, therefore, it cannot be said to be going strong. Well-bred specimens are beautiful without doubt, but blue, even with black markings, is not the easiest colour to establish and maintain. Striving to perfect these points has driven utility to the wall, while the somewhat high percentage of "off" colours produced from the best show stock has told against the breed's popularity. Nevertheless, with one so old, and having put up quite a good showing as egg producers, it should not be too difficult to re-establish the Andalusian as a first-rate layer of white eggs.

Standard Requirements. Like the Ancona, the chief points for its exhibition are colour and markings of the plumage, which, however, amount to 50 per cent in the Andalusian. Add to this 25 per cent for head points, and only 5 per cent each for type, size, carriage, tail and condition, and it will be seen why the breed to-day is practically fit for the ornamental section only.

The Aseel (Sitter)

It has been said by some authorities that the Aseel is the true Game fowl of the East, and that at one time it was largely kept and highly prized in India for its fighting propensity. Specimens of the fighting cocks of India and the East, which I have seen, and descriptions of such birds which have been supplied to me by keen observers, have, however, strengthened my belief that the breed which we know as the Aseel —practically a miniature of the Cornish or Indian Game, although not classified as a bantam—is not a native of the East. It is certainly of a pugnacious disposition; but, in my opinion, it cannot compare in agility with the Old English Pit Game. As a matter of fact, the word Aseel (Arabic), properly spelt and pronounced Asl, is an adjective, and simply signifies the best of its kind. It is really a misnomer when applied to any one particular breed of bird, while, like our English word "Game" when mentioned in connexion with fowls, it has no plural.

General Characteristics. The breed belongs to the sitting class. Its general aspect is somewhat squat, thick-set, and cobby. The body is short and almost round, broad and high-shouldered and straight-backed, rather narrow at the stern but thick and strong at the root of the tail, with short and strong wings, short tail, the cock's fitted with sickles tapering like a scimitar to within three or four inches of the ground. The legs are thick, muscular, and short, the shanks featherless, and the toes (four) straight. The head is broad and the brows somewhat overhanging, which gives the bird a grave and almost cruel expression. The beak is strong, thick and short, the comb triple (or "pea"), hard-fleshed and small, and the face hard. The eyes are bold and the ear-lobes small, but the bird is devoid of wattles. The neck is short and powerful, with scanty feathering and clean throat. The plumage is extremely hard and springy; and through it the red skin is often revealed at the crop, keel, thighs, hocks, and vent. The carriage of the bird is bold; and when in the hands the body is firm and muscular, very heavy in comparison with its size. Cocks average about 4 lb. and hens 3 lb., although the standard weights are given as 6 lb. and 5 lb. respectively.

Varieties, Colour, and Markings. There is not a standard for colour of plumage, because the colour, variation, and markings are almost endless; but the most frequently met with in this country in the show pen are Black and Black-Spangled, Grey, Red and Red-Spangled, White, and Yellow.

Utility Properties. The birds are unquestionably of a very striking and handsome appearance; and with their bold and keen eyes, upright carriage, and strong frame and hard feathers, they impress one as being of a fighting type. From a commercial point of view, however, they are of very little consequence. The hens are only indifferent layers; pullets have been known to lay fairly well during severe wintry weather, but the eggs, which have tinted shells, are small. The chickens are hardy but do not feather at all quickly. They are well suited to confinement, and the hens are close sitters and reliable mothers. The cockerels, too, make plump little table fowls, there being plenty of breast meat, while the flesh is of especially fine texture and flavour. However, the Aseel is certainly not cultivated for its utility points.

Standard Requirements. Type, head, and condition are the most important points for exhibition, and get 65 per cent between them; 10 per cent is allowed for tail carriage, while neck, stern, plumage, legs and feet get 5 per cent each.

The Australorp (Sitter)

The Australorp is the Australian Black Orpington, and virtually the original Orpington brought out in 1885 by the late William Cook (who was the pioneer of commercial poultry-farming in England) when he was residing at Orpington, Kent. There is at least one breeder—in Australia, admittedly—who claims that "the type or breed is of Australian origin," and that the stamp adopted for the Australorp "beats out of sight the old variety of the popular black layer formerly called the utility Orpington." It is quite true that the breed is distinct from the up-to-date standard-bred Orpington for exhibition purposes, the type fostered by the four specialist Orpington Clubs existing in England. But it is not a distinct breed of Australian origin. The present-day Australorp is just the old Black Orpington bred along production lines, although some authorities have stated that it resulted as a cross between the Orpington and the Australian or Chinese Langshan, while others claimed to have made it from Minorcas and Croad Langshans. However, it was left to Australian breeders to evolve from the original Kent (England) breed known as the Orpington one of the greatest layers ever entered in public competitions. They bred it along laying lines and made it world-famous for egg production.

General Characteristics. The Australorp belongs to the general-purpose group. Although according to the Standard the weight of the fully-matured cock is 1 lb. less than that of the English Orpington—the hen of each kind is the same—it is what may be termed a heavy. The body is wide, deep, and reasonably long; but the rising saddle of the male bird and the gentle sweep of the cushion of the hen up to the tail give it

FIG. 150. AN AUSTRALORP PULLET

a somewhat cobby appearance. The front is full and round, the shoulders are broad and the wings tightly carried. The tail is broad but not too high, while the cock's should not be furnished with long streaming sickles.

The head is somewhat small, the beak short and curved, and the comb (single) of medium size, erect and well serrated. The eyes are bold, the wattles of medium size, and the ear-lobes small and of oval shape. The legs are a fair length, not stilty but by no means short—in fact, any tendency to short legs is undesirable—well apart, and with the thighs showing. They and the shanks must not be too stout, the latter being of "medium bone" and free of feather. The toes (four) are long and well spread.

The carriage is active and alert, that of a real worker. The standard weights are given as follows: Fully matured cock, 8 lb.; cockerel, also hen, around 7 lb.; and pullet on the point of lay around 5 lb. Excessive weight, denoting sluggishness and inactivity, should be avoided. It is worth noting that the Australorp

has short and almost tight plumage when compared with the modern Black Orpington of the show pen. And in this respect, and the almost silky texture of it, the breed is very similar to our old-type Orpington. There must be no "bagginess"—i.e. unduly soft and hollow feathering—at the base of the tail or on the thighs, while the abdominal fluff should be springy. This means that the plumage should be that of a healthy and active bird, but not hard like the feather of the Game fowl.

Variety and Colour. So far, there is only one variety, viz. the Black. But since there has lately been talk in Australia about a White—"the pure white sport chick hatched from eggs laid by pure-bred utility Black Orpingtons"—no doubt the breed will be increased. It is, however, single-combed. The plumage is black. It should be well glossed on the surface with a beetle-green sheen, and be free of blue, bronze, or purple tints, or barring. In both sexes the beak, legs and feet must be black, the soles or pads of the latter inclining to white but not yellow. The eyes are black with black or very dark iris, but not light or red, since such eyes are considered as serious defects. The comb, face, ear-lobes and wattles are red, the colour that denotes vigour.

Utility Properties. The Australorp is a general-purpose breed, and as such it must be considered. Because it had put up some excellent egg records, it was popularized as a super layer. But too much attention has been paid to its powers of production, and it has been developed along the wrong lines. It is this, I feel sure, which prevents the breed making much headway as a commercial proposition in this country. My experience is that the numbers are satisfactory; but, as happens to some other super laying breeds, too many of the birds produce eggs under standard weight. Lack of size has put them out of the running in the tests. Add to this failing a tendency for the eggs to be by no means deeply tinted (they are supposed to be brown), and it is not altogether surprising that the Australorp does not find favour with those who keep fowls for a maximum profit. These points of size and tint are certainly worth the very careful attention of breeders who specialize in Australorps. Quantity of eggs is not all that a breed must possess to-day to make it popular. Size of egg is of primary importance to capture the best market, while colour of shell is well worth studying.

Granted improvement in these matters, then there is little to prevent the breed forging ahead. I would much rather aim for them than for mere numbers. And for such a purpose the Australorp should be hatched very early in the year, so that the pullets are given time in which to develop for autumn and winter laying. The cockerels can be grown into plump table birds. The skin is thin and of fine texture, while the flesh is white and plentiful on the breast. The only drawback to them for the top trade is the colour of their shanks. For sitting and hatching, the hens are very dependable. They are docile and easily handled, and are such careful mothers that they can be entrusted with the most valuable of eggs. The chickens are among the hardiest to rear, even in winter, and they grow well when properly managed; but they should be hatched early when destined for stock or laying purposes.

In utility properties (except for number of eggs) they do not yet equal the old-type and English Orpingtons. As a matter of fact, there is practically no difference between the Australorp and the Black of the old-type, while it is simply quantity of feather which separates these breeds from the Black Orpington of the show pen. However, the Australorp exists as a standard breed, a breed whose standard is recognized by the Poultry Club. Hence, as it was among the first in this country to be standardized along production lines by utility experts, it should be right on top in these utility times.

For Sex Linkage. The Australorp cock is serviceable to link with hens of any barred or cuckoo variety; and it should be useful with the Barred Plymouth Rock. Personally, however, I should keep it pure rather than try it out for sex linkage.

Standard Requirements. As the breed has put up some very good performances at laying competitions in this country, and it came back to the homeland with an excellent reputation as a layer, indications of productiveness figure as 20 per cent in the scale of points. A similar percentage is also allowed for general colour, and 20 per cent, too, for general type, the remaining 40 per cent being equally divided between head points, legs, condition, and size and symmetry.

The Barnevelder (Sitter)

Of Dutch origin, the Barnevelder—like our own Sussex and, too, the American Rhode Island Red, as well as the Dutch Welsummer—was produced without any attempt at exhibition points. Standard type, as English fanciers know it, played no part in the Dutch breeders' plans. Among the peasant poultry-keepers, in the district from which the breed derived its name, the important factor for a considerable period was the production of fowls which could be depended upon to lay eggs with rich brown shells. And so carefully was the stock selected season after season that this object was achieved. From its earliest days as a distinct breed—about the beginning of the present century—the aim was uniformity of shell colour rather than definite shape of body and excellence of colour and markings of the plumage. The poultry-

keepers in the Barneveld district were intent upon producing for our markets those best-quality eggs called "Dutch all browns," although when they started to select a breed out of their brown egg layers they chose birds with black or brown plumage. It has been said that the Barnevelder was brought out almost a century ago. But from the standard-breeder's point of view the original fowl of the Barneveld could not be classed as a pure breed. And there must have been very few poultry enthusiasts in our country who knew anything about it before 1921.

Until English breeders took the Barnevelder in hand it lacked definition as regards type and colouring. Something like a dozen old-established breeds and varieties were "mixed" to produce it; and among them have been mentioned Buff and Partridge Cochins, Croad Langshans, Dark and Light Brahmas, Black and Buff Orpingtons, and Modern Game. Some authorities have hinted that a short cut was Indian Game and Golden Wyandottes. One suggested that the foundation—eighty years back, according to him—was the Partridge Cochin, which was crossed in 1885 with Brahmas, and a few years later the Croad Langshan; and then "these Barneveld fowls were crossed with Buff Orpingtons." He even fancied that the Golden-Laced Wyandotte was used in the make-up of the Barnevelder, and also that the Brown Leghorn played a part in it. But whatever crossings and over-crossings there may have been, the aim all through was "big brown eggs." That is the Barnevelder slogan.

General Characteristics. The Barnevelder belongs to the general-purpose class, but on the light rather than the heavy side, despite the weights mentioned in the Standard. And while it was popularized in its early days almost solely as a layer—and some breeders have foolishly attempted to develop it into a super producer—it is a good table fowl. In shape and type it somewhat resembles the original (Croad) Langshan, but it is not quite as heavy. Its appearance is alert, compact and well-balanced, and its carriage upright.

The cock's body is moderately long, deep, and broad, with rising saddle, deep stern, short wings, and full and gracefully curved tail. His neck is fairly long and full and carried erect. His head is neat, the comb single, of medium size and erect, with the heel of it following the neck. His beak is short and well curved, his eyes prominent, lobes long, wattles fairly short, and face smooth. But while white in lobes and side sprigs on comb are serious defects for exhibition purposes, the head of the Barnevelder is really not a very important point. The legs are of medium length, the thighs showing distinctly, the shanks free of feather and the toes (four) well spread. The feathering throughout is of nice texture and fairly tight.

The hen's "build" is similar to that of the cock, allowing for the natural sexual differences. The standard weights are: Cock, 7 lb. to 8 lb.; cockerel and hen, 6 lb. to 7 lb.; and pullet, 5 lb. to 6 lb. In connexion with type, there is a special note in the Standard issued by the British Barnevelder Club. It is to the effect that the characteristics of the breed are "the upright carriage, the fairly long and full neck and tail, the high set saddle, and the proportionate depth of the rump by which the body appears compressed and gives a concave appearance to the back, which should be of medium length. The tail forms a graceful and uniform sweep." In my opinion it is this compressed and concave appearance which gives the Barnevelder its own type, and ensures its being distinguishable from breeds in the same general-purpose group. It may be that "type" is feathering only; but it is generally this which enables us to distinguish one breed from the other.

Varieties, Colour, and Markings. There are at present only four varieties of the breed, the Black, the White, one which may widely be termed the Black-Red, and known as the Partridge, and the fourth the Double-Laced. The plumage colours of the Partridge and Double-Laced varieties consist of black (with beetle-green on the surface) and red-brown. The Double-Laced cock's hackles are black with slight red-brown edging and red-brown centre (stem), finishing black to tip—that is, the actual end of each feather of the neck and saddle hackles is black. His back and cape are red-brown, the feathers having very wide black lacing; his breast, abdomen, thighs and tail are black; and wings, the bow and the bar, red-brown with broad lacing—the primaries black on the inner edge and brown on the outer, and the secondaries similar but the outer edge finely laced with black, showing, when closed, with a red-brown bar.

The hen to match has a black hackle. Her general plumage is red-brown (clear of peppering), each feather with definite black outer and inner lacings, but the outer lacing distinct yet not so heavy as to give a black appearance to the bird. That is, there must be red-brown distinctly showing when the hen is staged for exhibition. Her abdomen is black (with black down preferred), her main tail feathers black, and her undercolour grey. Her wings should show a brown bar.

The Partridge cock's hackles are red-brown, with distinct but small black tips, red-brown quills and grey fluff. His breast, abdomen and thighs, wing bar, main tail feather and sickles are black, all visible feathers showing a beetle-green lustre. His back, cape and wing bow are red-brown with wide black tip, grey fluff and red-brown quill. The wing bar is black and the lower tail coverts red-brown peppered with black.

The Partridge hen is very similar to the laced hen,

that is, black and red-brown. The only difference is that her ground colour is evenly stippled with black —peppered, in fact—and there is no inner lacing or pencilling. She may well be described in plain language as single-laced (like the Gold-Laced Wyandotte, for instance), but with peppered ground colour, even in her cushion.

The Black variety is all black with beetle-green sheen. It is about as old as the original and was produced simply by selecting Barnevelders for the black colour. The White is the latest variety to be brought into prominence. The difficulty is to get genuine white feathering, because, so far, creaminess verging on brassiness is the natural colour. The best cocks of this variety which have been bred up to the present time have decidedly cream-coloured hackles; according to the Dutch club which is fostering this "sport" of the laced Barnevelder, the cream shade is, for the time being, a standard requirement.

In all varieties the comb, face, ear-lobes, and wattles are red, the beak yellow with dark point, the eyes orange, and the legs yellow. Black legs are serious defects.

Utility Properties. Although the Barnevelder is standardized as a sitter, which means that it is a general-purpose breed and belongs to the heavy class, it is practically non-broody; in fact, in some strains broodiness has been entirely eliminated. It is, however, a general-purpose kind; and as such it must be considered. For table purposes the cockerels "come up plump and heavy," to use a common expression, while their flesh is white and of fine flavour, not unlike game. The birds are fine-boned and carry little offal.

The pre-eminent feature of the breed is, of course, the size and colour of its egg—big and brown. It is said that when the pullets start to lay, their eggs are of such a size that they can go in with the hen products and claim top prices as "standards." It may be so; but if it is actually so, then the pullets can scarcely commence laying at anything like a profitable age. This, to tell the truth, has been one reason why the Barnevelder has gone out of favour with some poultry-keepers—their spring-hatched pullets have been only indifferent winter layers.

Admittedly, there have been a few exceptionally fine performances put up by the breed at Laying Tests. The best, perhaps, was at Harper Adams in 1929, when a Barnevelder gave an official record of 239 in forty-eight weeks, and only five of the eggs were graded as seconds. However, while quantity has been steadily increasing, there can be no question that small eggs have been creeping in to a disquieting extent. The laying capacity of the breed has improved considerably of late, but not altogether without loss in size of egg.

As a free-lance so far as breeds are concerned—not being interested in any particular kind—I must say that a great mistake in connexion with the Barnevelder has been the attempt to get sensational records. One of the characteristics of the breed is the large brown egg; but the quest for record numbers is bound to have a detrimental effect on size and, too, on colour. Utility covers more than eggs alone. A general-purpose breed should not be developed along super-laying lines. The Barnevelder is undoubtedly a good layer, but it also has very useful table qualities. It cannot equal the pedigree-bred White Leghorn for number of eggs, or any breed bred solely for market chickens as a table fowl. But pullets can be bred for big brown eggs, and cockerels for market because they are good feeders and quickly put on flesh.

The breed has long since become acclimatized to the vagaries of our weather. It is hardy, the chickens are not difficult to rear, and in good hands early-hatched pullets can be depended upon for winter production. The Barnevelder's continued popularity lies in its large brown eggs. And this, combined with its useful table qualities, will make it one of the best dual breeds we have to-day. It should not be developed along recording-breaking lines for egg production. It is a bird of colour and markings, and it wants "breeding" for the show pen. And yet it should appeal to the small breeder and back-garden poultry-keeper, if merely because (except in the White variety) its plumage is not affected by the smoke-laden atmosphere of town runs.

For Sex Linkage. As the Double-Laced and Partridge varieties are "golds," males of these colours can be linked with "silver" hens. It may be possible to link either of them with the White Barnevelder hen. That, however, is only a suggestion. My experience with the Partridge male and Light Sussex hens is that the union is a perfect one for sex linkage, while the cross produces plump chickens for the hotel trade, the *petits poussins* so much in demand.

Standard Requirements. Type and size combined rank as of most importance—30 per cent—but colour (and markings) of the plumage are close up with 25 per cent. Then follows texture—the general handling of the plumage and skin—15 per cent—and head, legs (and feet), and health 10 per cent for each. It is imperative to produce birds of good type for the show pen, and particularly in the Black variety, otherwise almost any black plumaged cross-bred fowl can be exhibited as a Barnevelder.

The Brahma (Sitter)

Ancient as is this breed of fowl, it is little known to the rising generation of poultry-keeper. Nevertheless, while it is nothing like as much to the fore as

it was in my young days, there is that about the Brahma, even to-day, which makes it attractive. Having occasion recently to refer to my book-shelves, I turned up a second edition of "The Brahma Fowl: a Monograph," by Lewis Wright and published in 1871. And, as showing to what extent the breed was then in vogue, it is mentioned in the preface that the

FIG. 151. A YOUNG DARK BRAHMA HEN

whole of the first edition of that treatise was exhausted within eighteen months of publication, "and in the meantime the entries of Brahmas at all the principal shows have nearly doubled."

The breed, of course, was known long before 1870. It had already then made great strides, while at that date it was said to occupy "a position among poultry similar to that of the Shorthorn among other races of cattle." In addition to this, there were those who declared, "It will thrive and pay where no other can be kept in health; and as a purveyor—not of the very choicest—but of choice, honest, solid food it is about the best fowl we have ever bred."

However, to pass on to its origin. To quote from the author just mentioned, "No subject has caused so much, so long, and such angry discussion as the origin of the Brahma fowl." That was written early in 1870 and, of course, in pre-Orpington days. The first chapter of that monograph, a matter of over thirty pages, is devoted to origin. But, although much ink was spilt over the controversy, it is safe to say that, even to-day, there is no agreement as to the origin of the Brahma.

Some authorities said it was a new fowl imported from India; others that it was obtained by crossing the Cochin and Malay, or the Cochin and Chittagong. And there were those who claimed it as an American breed made solely from Cochins. One thing, nevertheless, appears to be certain; the breed was first introduced into England in 1852, when two pens of it were on view at the Birmingham Show, while an American breeder sent over specimens of the earliest so-called Brahmas as a present to Her late Majesty Queen Victoria early in 1853.

General Characteristics. Among amateur poultry-keepers there are some who appear to imagine that the Brahma is akin to the Cochin in general make-up. But these breeds differ in several points; and not the least of them is in what most fanciers know as type. Even though some claimed for it American origin, the breed, for years, has been grouped among the Asiatics. In its early days it was known as the Brahmapootra, and was supposed to have come from the banks of the Brahma-Pootra. It is of the heavy kind; it ranks among the heaviest of our standard breeds, as a matter of fact, and, of course, it is considered as a general-purpose fowl. It has, or had, the capacity to lay, and the flesh required for the table.

The cock's body is broad, square, and deep, with full breast and horizontal keel. His back is short and broad—it can scarcely be too broad—while there is a slight and almost imperceptible hollow between his shoulders. The saddle, which should be as broad as possible, rises from the neck-hackle well up to the tail, which point, the rising saddle, is of great importance in the breed and is, indeed, a distinguishing mark. The wings are medium-sized with horizontal lower line, well tucked under the profuse saddle-hackle; and the tail is of medium length and almost upright. His legs are moderately long, powerful, well apart, and feathered to the toes, these latter—four on each foot—being straight and well spread.

The head is small and fine, with slight prominence over the eyes, which are large and set back somewhat. The comb is triple or of the "pea" stamp, small and closely fitting. It should have three rows or sets of serrations running parallel to one another, and the centre one slightly higher than the others. The face is smooth and free of feather, while the ear-lobes are long and fine, and the wattles small and rounded. The neck is somewhat long and the hackles are profuse, reaching well down to the shoulders.

The carriage is standardized as "sedate but fairly active," and the plumage as "profuse, but hard and close compared with the Cochin." An old fancier of the breed once wrote, "As to general character, let me urge the infinite superiority of the 'Gamey' looking Brahma over the 'Cochin' type." As a

matter of fact, the carriage of the Brahma cock is quite distinctive, combining great activity with lordly dignity, the high-carried head and tail and rising saddle adding much to his appearance. He is, when fit, a truly noble fellow, and the hen is an excellent match for him in size and beauty. The weight of the male bird runs from 10 lb. to 12 lb., and of the female 7 lb. to 9 lb.

Varieties, Colour, and Markings. Only the Dark and the Light varieties are exhibited nowadays, but there have been two others, viz. the Buff and the White. These latter, nevertheless, were bred in such small numbers that they were rarely seen at shows. They have certainly not been penned for competition of recent years. It is not too much to say that for beauty there are few, if any, breeds which excel the Brahma when well bred for the show pen. Both varieties, the Dark and the Light, are black-and-white fowls.

The Dark is similar in colour and markings to the Silver-Pencilled Wyandotte, and it was from the former that the Wyandotte of this branch was developed. The cock's breast, under-part of body, thighs and fluff are intense glossy black. His head and hackles are silver-white, the hackles, both of the neck and saddle, having a sharp stripe of black in the centre of each feather. His back is silver-white, except glossy black edged with white between the shoulders, and his tail black or the coverts laced with white. The wings are black and white, with a glossy black bar, and the leg feathers black or slightly mixed with white.

The markings of the Dark hen's body are pencilled, crescent form. The ground colour is any shade of clear grey, and the pencilling black or a darker shade of grey than the ground colour. The pencilling is particularly fine. It follows the outline of the feather and must be sharply defined, uniform and numerous. Her head may be silver-white or striped with black or grey, her neck-hackle similar to that of the cock or with pencilled centres, and her tail black, or edged with grey, or pencilled.

The Light is practically white, but the neck-hackles of both cock and hen are striped with black, while the tail may be black or edged with white, and some black is admissible in the shank and toe feathering. In both varieties and sexes the beak may be yellow or yellow and black. The eyes are orange-red, the legs and feet orange-yellow or yellow, and the comb, face, ear-lobes, and wattles the usual bright red.

Utility Properties. Perhaps it is stretching a point to say that the Brahma of to-day, as bred in this country, has much claim to utility; but early-hatched pullets are by no means poor layers when reared on range. Their eggs can seldom be considered as specials from a market viewpoint; but they have rich brown shells, and find a ready sale. The hens are reliable sitters and easily managed. They become broody early in the season; and if their feet are not too heavily feathered they brood well, and make excellent mothers. As table fowls they cannot be recommended except for crossing, as the meat is more on the thighs than the breast. Still, well-fed cockerels are not to be despised. The Brahma is a hardy breed, and will thrive on almost any land; but it gives better results for utility when at liberty than in confinement. The chickens are somewhat slow in feathering.

For Sex Linkage. Like the Sussex of that colour, the Light Brahma is a silver for sex linkage. Hence the hens could be mated with any breed of "gold" cock for that purpose. Few poultry-keepers, however, would think of linking the breed, solely because it is not reckoned among the best of the general-purpose kinds. And yet Light hens could be tried with Rhode Island Red cocks for the production of big market chickens, while crossing them with Barnevelder cocks should result in fairly good all-round birds.

Standard Requirements. Most exhibitors strive after colour and markings, since these points combined are allowed 40 per cent. Type and feathering rank as a poor second with 15 per cent, while head, legs (and feet), size, and carriage each get 10 per cent, and condition merely 5 per cent. It will thus be seen that, to-day, the Brahma is considered much more as a show bird than a useful fowl in this country.

The Bresse (Non-sitter)

For commercial egg-farming the Bresse fowl is not yet so largely kept as, for instance, the Leghorn. However, it is met with in sufficient numbers up and down the country to render it fit to rank among popular breeds. That it could be placed well in the front line as a commercial proposition there can be no doubt, because while, like practically all the non-sitters—to which group the Bresse belongs—it produces white-shelled eggs, it has the decided advantage of being good for table. Granted that in certain quarters the white egg is a drawback. But for those who wisely value eggs for their contents and judge them not merely by the colour of their shell, there is no better breed to cultivate. The eggs are almost invariably of true shape, pleasing to the eye, and readily marketable.

Less than ten years ago the Bresse was being hailed by a well-known poultry specialist as one of the latest introductions from France. This led some people to imagine that it was a new breed, or at any rate one which required moulding to our English ideas. Such, however, was not the case. It was not then new even to poultry-keepers in this country—I was breeding

Bresse in 1910—neither was it without a standard to which it conformed. It was, in fact, so fixed that in every way it was pure bred, and more so than some we see under that title to-day. It came into prominence in England in 1905. In the 1904–5 four-months' laying competition held at Royston, Herts., a pen of four pullets put up a score of 240 and stood second —by five eggs—to White Leghorns, which breed was then considered as an indifferent winter layer. Even

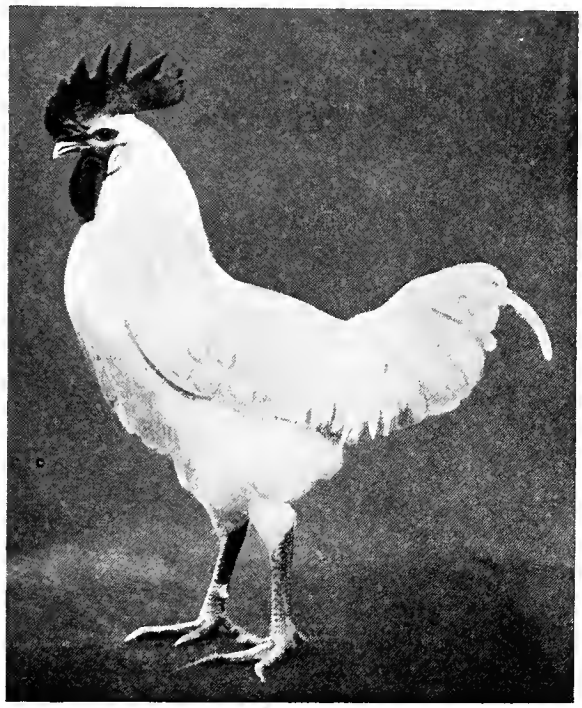


FIG. 152. A WHITE BRESSE COCKEREL

thirty years back, though, the Bresse was a very old-established breed—there is a record of its existence as early as 1591. Still, there appears to be little doubt that it is one of the oldest breeds in France, while some authorities state that it is, indeed, the oldest of the French breeds.

Of its actual origin little is known. The Grey and the Black are said to be the first varieties. Some writers claim that the former was bred simply from the Braekel, while others have traced its descent from crossing the Campine with the Blue Game. The Black, probably, sprang from the common black fowl of France. It may or may not have been finally established by crossing in the Grey. But it seems to be agreed that these two varieties did not originate in the same stock. The Blue Bresse came out about the seventeenth century, although it does not appear to have existed for any great length of time. The White, bred from the Grey, was originated about the middle of the nineteenth century, while the Buff is quite a new variety.

General Characteristics. The Bresse belongs to the non-sitting and light class, but, like some others from the Continent, it is really a dual-purpose kind. It differs from most breeds of its standard group in that the cockerels plump well for the table. Some say that the general bearing of the breed is similar to that of the Hamburgh. But, while it is graceful and symmetrical, it more closely resembles the Campine. It is a compact fowl—well built, according to the standard.

Its front is deep and round, the back moderately long, wide at the shoulders and stern, with sufficient depth through to indicate productiveness. It is in no way coarse or heavy, although better in hand than it appears to be in ranging. The wings are long and carried closely to the body, while the tail is fully developed; the cock's has well-rounded sickles and is carried at an angle of about 45 degrees with the back. The head is of medium size, with strong and short beak and bold eyes. The comb, single, is inclined to be small. It is carried erect on the male bird, the back of it being clear of his neck, but following the curve of his head. It falls slightly over either side of the face of the hen.

The legs are of medium length without stiltiness, the shanks smooth and free of feathers, and the toes (four) long, straight and well spread. The carriage is active and graceful, the birds being most alert, while the plumage is fairly tight and of nice texture. The standard weights are as follows: Cock, 5½ lb. to 6 lb.; cockerel, 5 lb. to 5½ lb.; hen, 4½ lb. to 5 lb.; and pullet, 4 lb. to 4½ lb. In my opinion 6 lb. should be the absolute maximum for the fully matured cock and 5 lb. for the second-season hen.

Varieties, Colour, and Markings. Those five just mentioned, viz. the Black, the Blue, the Buff, the Grey, and the White, complete the list. All are single-combed. The only two varieties standardized at present are the Black and the White. The former is an all black, that is, black to the skin. The surface has a brilliant beetle-green sheen; blue-black or black with a purple barring is objectionable. The White is pure white, free from straw tinge, the whiteness of driven snow as some describe it, with a decided gloss and not a dull or dead surface. Often enough, however, there is a slight blue tinge in the White Bresse.

The plumage of the Blue is an even medium shade of that colour from head to tail, with a dark tint in the cock's hackles, but no black, "sand," or any other colour than blue. The variety is self-coloured and not laced or barred. The Buff can be practically of any shade, avoiding washiness at the one extreme and a red tinge at the other; the ideal is to get uniform

colour, except that greater lustre is allowed in the hackles and wing bows of the male bird than on his breast.

The Grey cock is marked, in some respects, like the Silver-Pencilled Hamburgh. His hackles (neck and saddle), shoulders, wing bow and chest are white; thighs, abdomen, and between legs inclined to grey; while grey feathers are often seen through his wings. His tail is black, each feather being edged with white. The hen's hackle, front, and shoulders are white, but some of the feathers on the lower part of her breast show a more or less grey pencilling. Her cushion has definite marking going across the feather, the dark grey bars being twice as wide as the white. Her sides, abdomen and under-plumage are just grey.

As regards the head points, etc., of the Bresse, they differ according to the varieties. Thus in the Black and the Blue the beak is dark horn, the eyes are black or dark brown, the comb, face and wattles dark red, and the ear-lobes snow-white, while the legs and feet are blue-grey. In the Buff, Grey, and White varieties the beak is blue-white, but the face may be red or sooty. The eyes are black or dark brown, the comb and wattles dark red, the ear-lobes blue-white or white (a little red is allowed), and the legs and feet slate-blue.

However, the ear-lobes of all varieties should be white with a distinct blue tinge, the comb dull red with a purple over-shade, the face sooty but free of feathers, the eyes black, and the legs slate-blue. The peculiar colour of the comb just mentioned leads some people not acquainted with the breed to imagine that such birds are suffering from "liver trouble." Of course, it is not so. Bresse sporting the purple-shaded combs are among the most active fowls and, too, they can be relied upon for laying qualities. Such colouring of the head points as the foregoing was seen on the Bresse of my early days. It should be insisted upon now, because it stamps the breed as distinct from others. The insistence on snow-white lobes and ruddy faces and head appendages has led some poultrymen to cross the Bresse with the Minorca and other breeds, to the detriment of the true Bresse.

It cannot be too often reiterated that the Bresse has breed characteristics peculiarly its own. To ignore them is to produce birds which, in the Black variety, might easily be considered by the general poultry-keeper as very indifferent Minorcas, and in the Wnite, as Leghorns of sorts. Those who take up the breed should study closely standard requirements as far as they concern the general characteristics. Keeping them always in view prevents the mongrelizing of the Bresse by out-crossing. Cross-bred birds have been exhibited as Bresse.

Utility Properties. Without doubt the Bresse is a dual-purpose breed. The combination of good laying qualities and excellent table properties in a light breed makes it one of the most useful fowls in the world for all classes of poultry-keeper. It is particularly hardy and vigorous, and breeds true to type, while the chickens are easy to rear and mature quickly. It has always been famous as a table fowl of the finest quality —it was originated solely for that purpose. The cockerels are plump and full-breasted, and almost as meaty as Old English Game. They are white-fleshed, fine-boned, and carry very little offal. Properly fattened chickens dress well for the table.

The pullets are prolific layers and flock averages of 200 eggs per annum are not unknown. As one of the oldest breeders of it I state definitely that the Bresse was never intended to be a super-super producer of eggs, and those breeders who aim for mere numbers are doing it a disservice. Egg size should be carefully studied now that grades enter into marketing. However, it is not difficult to get true Bresse which lay standard weight eggs, and those of special grade for the most exacting buyers, and in numbers which prove profitable to the producer.

The breed will never equal the Leghorn for quantity; but good egg size rather than too prolific production pays well enough when, as in the case of the Bresse, it is combined with really fine table qualities. In this latter respect, there is an excellent opportunity for the disposal of surplus cockerels. Much as some breeders of "pures" may deplore it, there is an increasing demand for cross-bred birds. The White variety mated with medium-sized Indian Game hens produces small but plump table chickens, broad and deep-breasted, with the minimum of offal, and almost resembling the wild partridge. Another excellent cross, and particularly for the production of quick-growing chickens for the spring markets, is the White Bresse with Light Sussex hens. Others are the White Bresse with Buff and White Orpington, White Wyandotte, and Rhode Island Red hens. However, despite its dark shanks, the pure Bresse should be good enough for anybody who does not require large table fowls.

For Sex Linkage. In none of its varieties is the breed a silver or a gold for sex linkage, although the White might answer as a silver. The Black, of course, can be mated with any breed of barred female, such as the Plymouth Rock or Scots Grey. The Bresse, however, is a slate-legged fowl, hence a cockerel of any of its five varieties could be run with any breed of female possessing white or yellow legs. Such unions as these are said to produce light shanked cockerels and dark shanked pullets, but this method is nothing like as satisfactory for the novice as that of plumage characters. In my experience not every breed with light shanks will give sex-linked results, while the

beginner will find it difficult to distinguish between light and dark shanks in day-old chicks. I once tried a White Bresse cockerel with White Leghorn hens; and since both of these breeds are old-established they were satisfactory for this particular purpose. The Bresse-Leghorn pullets were prolific layers, but the cockerels were not as good as pure-bred Bresse. As a matter of fact, for a light dual-purpose breed for strict utility, I suppose it would be impossible to excel the Bresse.

Standard Requirements. The breed is claimed to be an ideal one for the combination of beauty and utility; and to such an extent is this so that at most shows where classes are provided for it, those classes are in the "utility" rather than in the "exhibition" section. In its scale of points, 25 per cent is the allowance for type, 20 per cent for head, 15 per cent for colour (of plumage), and 10 per cent for "quality." I can understand why head points rank so high, because the endeavour should be to maintain the darkness of the eyes, face, comb, and wattles, and the blue-white tinge of the ear-lobes, as they are characteristic of the breed. "Quality" presumably refers to "indication of productiveness." Condition, size, and legs (and feet) each get 10 per cent. Condition is really an important point in such an active and graceful fowl, because any inclination to soft, loose, and "hollow" feathering should be severely penalized.

The Campine (Non-sitter)

Some authorities state that the Campine fowl belongs to the races of Eastern Europe; and this is not an unlikely contention, because it cannot be disputed that, in many respects, the breed resembles the Hamburgh of old, which came from Turkey. For over 400 years, however, it is said to have been the egg-laying breed of Belgium. It was introduced to our country in 1898 or 1899 by Mr. (now Sir) Edward Brown, who, after his second visit to Belgium, called attention to the breed's wonderful productive powers; and it at once became popular. The male bird at that time had a white saddle-hackle, a white patch on each wing, and a black tail, while the female's plumage was very mossy and largely devoid of any traces of pattern; hence she resembled a poorly bred Hamburgh with a single comb. In this direction it may be as well to mention that a Belgian breed greatly resembling the Campine is the Braekel. These two, in fact, have much in common; and the English Campine of to-day was undoubtedly evolved by crossing the Belgian Campine and the Braekel. In the land of its origin, nevertheless, or at any rate in Belgium, the smaller bird with the rounded breast and fan-shaped tail is called Campine, and the larger, longer-bodied fowl—having the appearance of being narrow and not wedge-shaped—is known as the Braekel.

General Characteristics. For general purposes it may be as well to class the breed as belonging to Belgium, since the Campine district, agricultural country, spreads over the Antwerp and Limburg provinces. It is of the light and non-sitting group of fowl. I have said that in many points the Campine resembles the

FIG. 153. A SILVER CAMPINE COCKEREL

Hamburgh. The body is close and compact, the breast full and forward, and the back fairly long. The wings are large—these fowls are quite good fliers—and well tucked up. The cock's tail is long, has broad and plentiful sickles and secondaries, and is carried well up and out, but not "squirrel." The legs are moderately long, the shanks and feet slender and free of feather, and the toes (four) well spread. Fineness of bone is a characteristic of the breed.

The head is fine and the beak rather short. The eyes are bold. In the original varieties the comb was single, carried upright on the male bird, but falling slightly over one side of the face in the female. According to the Poultry Club Standard, however, a rose type of comb is also permitted, although probably few poultry-keepers would recognize a Campine with such a comb, as it is too much like the Hamburgh. The single comb should be of medium size, inclined to be small if anything. It should be evenly serrated, and the back of it (on the male bird) clear of the neck. The rose comb is also on the small side, square fronted and tapering to the back, the leader (or back point) being straight out and level with the surface.

The face is smooth. The ear-lobes are small, free

of wrinkles, and almond-shaped rather than round, and the wattles long and fine. The neck is of medium length and abundantly furnished with hackle. The carriage of the Campine is graceful, but with an alert and somewhat "jumpy" appearance. It is among the most nervous of the light breeds, but can be easily tamed in confinement. According to the Standard the weight of the matured cock is 6 lb. and of the hen 5 lb. These weights may appear excessive; but the compactness of the breed is deceptive to the eye.

Varieties, Colour, and Markings. During the period of its popularity the Campine was exhibited in three varieties. These were the Buff, the Gold, and the Silver. The first-named, though, was never standardized by the Poultry Club, nor was it recognized in Campine circles. An attempt was made to get a White, but it never functioned. A Black and a Blue were also mentioned, although none of these three appears to have been exhibited in England.

Although only two varieties are standardized, the three mentioned above will be described. The Buff is white with rich buff barring, while the Gold is "rich gold and not washed-out yellow," with beetle-green barring, and the Silver has similar barring on pure white ground. The plumage, except the neck-hackle, in each variety is marked like a mackerel, barred or pencilled in a transverse direction, with the end of each feather white, gold or silver according to the variety.

The barring should form regular rings round the body, three times as wide as the ground colour. The markings must be sharp and with well-defined edges, the colours being distinct and not running into each other. On the breast and under-part, the bars are straight, but on the back, shoulders, saddle—cushion in the hen—and tail they may be of a V-shaped pattern, but preferably straight.

The neck-hackle is plain, not barred, white in the Buff and the Silver, and rich gold in the Gold variety. The cock must be furnished with properly developed saddle-hackles, and not, as in the hen, with cushion feathers. The beak and toe-nails are horn coloured, the eyes dark brown with black pupils, the ear-lobes white, the comb, face, and wattles bright red, and the legs and feet leaden blue.

Utility Properties. Laying qualities brought the Campine to the fore, and in its day it was a great layer. The pullets were prolific producers during spring and summer; and they could be made to pay at winter laying if well managed. The drawback is that the eggs are rather inclined to be small. Being white-shelled also, they do not find a ready sale in the usual market, although they are doubtless serviceable for a private trade. Commercially, therefore, the breed is not much of a success. The birds are hardy enough to rough it on a farm. They will thrive in confinement, but a grass range suits them better, even though too much liberty is apt to make them wild. The chickens mature fairly quickly; and pen-fed cockerels—they cannot stand cooping or fattening—make plump table birds. One thing to remember is that Campines are great fliers and can easily clear a 6-ft. high fence.

For Sex Linkage. Campines can be sex-linked within the breed, as can be seen, a Gold male on Silver female. However, few poultry-keepers would consider the breed as a paying one, hence its lack of popularity.

Standard Requirements. There is no doubt in my mind that the breed has been almost ruined as an egg producer by the Standard allowing 52 per cent of the points for the combination of colour and markings, these latter getting as much as 30 per cent. Perhaps this was advisable at first to ensure the birds being barred or pencilled right through their plumage—except on the neck-hackle—and having markings three times as wide as the ground colour. But 15 per cent was allotted for head points, the balance of the 100 being distributed between size and condition 10 per cent each, tail (development and carriage) 8 per cent, and legs and feet 5 per cent. Even to-day the most difficult part of the Campine to breed to standard is the breast markings, since the vast majority of them fail in that respect.

The Cochin (Sitter)

In the Cochin we have a breed which has had its ups and downs, many more downs than ups, perhaps, during the past two or three decades. However, interest in it is being revived of late, owing to a few breeders having discovered that its laying properties have not altogether been destroyed. Time was when the Cochin mania spread throughout this land; but that is ancient history, almost as ancient as the breed itself, and few, if any, present-day fanciers can recall it, even those who are the very oldest among us. I can recollect when no show of any importance was complete without classes for Cochins; and in my early days the breed was being exhibited to no small extent, and to a remarkably high degree of perfection. Good birds still exist; but one rarely finds at the shows of to-day the teams which were penned even a quarter of a century back. The breed had a good run as a fanciers' fowl, and yet it never was very popular for utility purposes, either as a layer or as a table bird.

It appears that Cochin Chinas were first known in this country before the middle of the last century and not far short of a hundred years back. But, as a well-known authority has remarked, those early specimens had no right to the name, because they were

principally of Malay blood. They were large and long-legged birds with hard plumage and scanty feathering. Their bodies appeared to slant down rather than up, and they carried large tails. Such, at any rate, were the birds depicted as Cochin Chinas in standard works of those days.

As a matter of history it may be mentioned that the first consignment of Cochins to reach England, in 1849, did not come from Cochin but from Shanghai in China, and that it consisted of eight birds. Among them were Buffs, from light lemon to rich red, and partridge- or grouse-marked. All these fowls were alike in type but varied in colour. Of their origin, one can merely say that they came from China. But, while the first importation, in 1849, was of one type, that type has been vastly altered since those early days.

General Characteristics. The breed belongs to the Asiatic races, and it is classed in the general-purpose, heavy and sitting group of fowls. No matter what its colour (or variety) the true Cochin is a lumpy-looking bird, whose chief characteristic would appear to be fluff. Particularly is this noticeable in the adult hen, which shows marked development of fluff. Her cushion and thighs resemble half balls of feather, just three large masses. And in that point alone the Cochin of to-day differs considerably from the Brahma. Soft feather and fluffy plumage is a peculiarity of the former breed.

The body is large and deep, broad from front to rear, full breasted and carried well down in front. The back is short; at any rate the full neck-hackle gives the appearance of shortness of back, while the sides are round. The cock's saddle is large and broad, with a gradual and decided rise to the tail and yet curved slightly down there; that is, there should be less rise at the tail than at the centre. This is a characteristic of the breed. The saddle should not rise and run into the tail, as in the ideal Brahma, although there are fanciers who say that it should form an harmonious line with the tail.

The wings are small, and tucked up in such a way that the flights are entirely under the secondaries. Their points, too, should be buried in the fluff and under the saddle-hackle of the male bird or the cushion of the hen. The ideal tail is small and carried somewhat low, the feathers being soft and with as little hard quill as possible. The tail should just show through the tail coverts. The less sickle or stiff feather there is in the tail of the Cochin the more ideal is that part of the bird; but all the feathers must be there.

The legs are short and stout, the thighs large and thickly covered with fluffy feathers standing out in globular form. The hocks should be entirely covered with soft and curling feathers, as free as possible of any stiff quills, which latter are known as vulture hocks. The shanks are thick and heavily feathered down the outside, the feathering standing out well from the very hock and continuing to the ends of the middle and outer toes; but always soft in quill. The feet should be large, and the toes (four) straight and well spread. Heavy feathering of the thighs, shanks, and feet, but soft feathers always, is a strong point.

The Cochin head is comparatively small—the profuse development of feather of the adult bird is responsible for that appearance. The comb is small, single, and upright, evenly pointed, and of convex outline; the beak short, stout, and slightly curved; and the face smooth and of fine texture. The eyes are large and fairly prominent, and the ear-lobes rather long in proportion to the wattles, and hanging almost as low as these members, which should be thin and round. The neck is somewhat short, carried forward, and covered with full hackle feathers, which should flow well over the cock's shoulders and give his back the desired short appearance.

The general characteristics of the hen are similar to those of the cock, allowing for the natural sexual differences. The whole appearance of the Cochin must be fluffy, not close or hard-feathered. The breed is a particularly soft-feathered one, and with profuse plumage on its body, legs and feet. The carriage is sedate, for the true Cochin is slow and dignified in its movements and gentle in its ways. It is, in fact, a truly likeable fowl. As regards weights, these are standardized at 10 lb. to 13 lb. for male birds, and 9 lb. to 11 lb. for females. The former weights in each case, however, are good enough, because its extreme feathering makes the breed look much heavier than is actual on the scale.

Varieties, Colour, and Markings. Six varieties of the Cochin are given in the Poultry Club Standard, and they are Black, Blue, Buff, Cuckoo, Partridge, and White. That appears to complete the list, for not, to my knowledge, has another colour been attempted. Of the Buff, of course, there are several shades, such as lemon, orange, gold, silver, and cinnamon; but all alike are classed as one, viz. Buff. Even though there are six varieties there is no need to go minutely into a description of them all. Black, buff, and white are practically the same all through the breeds—rich black with a beetle-green sheen; buff of any shade so long as the surface is level and the colour is sound to the skin; and glossy white, as pure as driven snow, free of any colour.

In the Buff, admittedly, and especially in this breed, the shade may vary considerably from pale lemon to dark cinnamon, but uniformity is essential

—freeness from lacing, mealiness, or white grizzling, mottling, patchiness, pencilling, peppering, and ticking, or an inclination to white. Naturally, too, the hackle feathers—and, in the case of the male bird, the wing bows—are generally of a slightly darker shade and more lustrous than those of the body; but they should tone with the remainder of the plumage.

The Blue is what is known in the Poultry Fancy as a self-colour, that is, there is no lacing as, for instance, in the Andalusian fowl; and the particular tint of this variety of the Cochin is "pigeon" blue. The cock's hackles, back, and tail should be of a darker shade than the remainder of his body, while the hen should be of one even shade all through, in both sexes the colour being free of rust, sandiness, or bronzing.

The Cuckoo is dark blue-grey on light blue-grey ground, the colours blending or shading into each other rather than showing distinct lines. The markings must be as bars or pencillings across the feathers. There should be no trace of gold or red tinge in the cock's neck-hackle; and his tail must be free of black or white. The markings should go right through the feather to the skin.

Briefly put, the Partridge, both in the male and female markings, is somewhat similar to the Dark Brahma; but in the Cochin dark red takes the place of white. Many years ago a well-known breeder said: "The Partridge cock is one of the most gorgeously coloured birds in the whole range of poultry breeds, the combination, a rich red, orange, yellow, and black, being worthy of some of the more highly coloured Parrot tribe." The chief point of the hen of this variety is her distinct pencilling in crescent form of rich dark brown or black on brown ground. This, in a finely bred show hen, runs well up to the top of her throat, and well back on cushion and fluff. And it is a decided advantage to have the leg feathering well pencilled.

As regards the head, etc., the comb, face, ear-lobes and wattles are bright red in all varieties of the Cochin. In the Black the beak may be yellow, horn, or black; the eyes bright red, dark red, or nearly black; but the legs must be lizard-coloured. The beak of the Buff is yellow; and so are the legs. Red or orange is preferred for the eye colour. At one time pearl eyes were permissible; but birds with such eyes are apt to go blind. In the Cuckoo rich bright yellow beak colour is desirable, but horn is permissible. The eyes should be bright red and the legs brilliant yellow. The Partridge's beak may be yellow or horn or yellow shading to horn; the eyes bright red or orange; and the legs dusky yellow. In the White the beak is standardized as rich bright yellow, the eyes as pearl or bright red, and the legs as yellow. But red-orange eyes are preferable in my opinion.

Utility Properties. However popular the Cochin may have been in its early days as a breed suitable for the farm, few farmers or poultry-keepers in this country would now turn to it for eggs or meat. Years ago the late Lewis Wright had to admit that "the modern standard of breeding has impaired their utility as layers and table fowls." So much has utility deteriorated, in fact, that to-day it is questionable if there exists an establishment at which the breed is kept except for exhibition. It is said that in America the Cochin ranks next to the Brahma as a meat fowl; and the latter is thought much of over there. I somehow cannot imagine there is much meat on a Cochin cockerel.

Still, the breed has its good points. Some strains are reasonably hardy, and have the capacity for winter laying. Cochins are ideal for confined places, and are even at home when shut in a shed. The chickens are fairly easy to rear, although naturally slow growers; and they will thrive almost anywhere with care. If bred for laying—they produce brown eggs—the pullets will be found serviceable during winter; but at most other seasons they are almost continually broody. On the whole, then, the Cochin cannot be recommended as a profitable investment, except for shows. For exhibition it is certainly a "stayer."

Standard Requirements. As might be expected, feathering is the chief point of the exhibition Cochin, and this gets 35 per cent, made up as follows: legs 10 per cent, cushion 8 per cent, fluff 7 per cent, and hackle and tail 5 per cent each. Colour (and markings in the Cuckoo and Partridge varieties) ranks next with 20 per cent; then follow size and head points 15 per cent each, type 10 per cent, and condition 5 per cent. Considering the difficulty of keeping the foot feathering in a good state of preservation, and the hocks free of stiff feathers, 10 per cent is certainly not too much to allow for leg feathering. A Cochin would be of little value for the show pen if it had a narrow and flat cushion—known as the saddle in the male bird—and were devoid of thigh fluff, while scanty neck-hackle and large hard-feathered tail would detract very considerably from its appearance. Fifteen per cent may appear to be a lot to allow for head points; but a coarse head, including a large comb, which has a tendency to droop, is not in keeping with the breed. The Cochin must be big and, of course, of good type; but the type may be such as to throw a bird out of competition.

The Coveney White (Non-sitter)

The Coveney White is an English breed, in that it was produced in the village of Coveney, near Ely, Cambridgeshire. It was brought out some years ago,

and was fully standardized by the Poultry Club in 1924, but no attempt has been made to popularize it, and it is very rarely seen in competition. As a matter of fact, although I have been judging at poultry shows up and down England, and elsewhere, for well over thirty years, and have also attended most of the chief events which have been held during that period, I cannot recall one at which there has been anything like a display of Coveney Whites. Indeed, I question if the breed has ever been exhibited, except at such shows as are mentioned in the Poultry Club Rules concerning the introduction of new breeds and varieties; and it had a short life as far as the poultry public are concerned. Some years prior to its introduction another poultry-breeder in Cambridgeshire brought out a similar breed which was called the White Coronet, but it, too, had only a short life.

General Characteristics. The breed belongs to the light and non-sitting class, and is purely and simply a layer. The body is somewhat small and covered with close and tight feathering; and to all intents and purposes it is a White Leghorn although its comb is cup-shaped, as in the Sicilian Buttercup fowl. The standard weights are given as 4½ lb. to 5½ lb. for the fully matured male bird, and 3½ lb. to 4½ lb. for the female.

Variety and Colour. There is only one variety, viz. the White. The plumage is pure white; the beak, legs, and feet are bright yellow, the eyes bright red, the comb, face, and wattles red; and the ear-lobes may be white or cream, but the former is preferred.

Utility Properties. The Coveney White was "made" for use on the farm; hence it is hardy, a quick grower from chickenhood, and a dependable layer of white-shelled eggs, like the hardiest strains of White Leghorns.

Standard Requirements. The scale of points is one of the simplest in the Poultry Club Standard. Thus, from 30 per cent for type it graduates through colour, size, and head (comb, lobes, and eyes) by a 5 per cent reduction for each to 10 per cent for legs and feet; and yet, for show purposes, one would imagine that head points, the breed's distinguishing feature, would get much more than 15 per cent.

The Creve-Cœur (Sitter)

Unlike the breed just mentioned, the Creve-Cœur is among the oldest in Europe, and, as can be imagined, it is of French extraction. Some authorities claim that it was the first of the gallinaceous races of Gaul to be cultivated in England. It flourished for some time in our country; but that was very many years ago, and at the present day specimens of it are rarely seen here.

General Characteristics. The breed belongs to the general-purpose class, in that it is a fine table fowl and a reasonably good layer. Its body is almost square and fairly massive, the back broad and flat, the breast full and deep, and the keel-bone straight, while the wings are large and closely folded. The cock's tail is large and carried fairly high, the sickle feathers being broad and long. His neck is of medium length, and well covered with sweeping hackle feathers, while the legs are short, the shanks free of feathers, and the toes (four) long and straight. The head is large, and the skull has a decidedly pronounced protuberance on top.

Perhaps the special feature of the Creve-Cœur is its head, as the bird is crested and has a comb of the horn type, namely, V-shaped. These adornments are somewhat difficult to describe accurately. The matured male bird carries a full and big crest. This is flat in front to expose the comb, well rounded at the top, and furnished with fine and long feathers which droop straight on to the neck, the feathers being similar to those of the bird's hackles. The beak is strong and well curved, and the eyes are full and prominent. The comb starts just above the beak, and from there to the commencement of the crest it resembles a small mass of red flesh, somewhat ball-shaped; and from it branch two small horns, upright and against the crest, each branch being smooth and tapering to a point. Between the wattles, and hanging practically from the lower mandible of the beak, is a bunch of feathers (known technically as the beard), while standing out from each side of the face is another bunch (the muffle). These bunches of feathers hide the ear-lobes—which are small—the throat, and the sides of the face, but they allow the fowl to have full use of its eyes.

The hen's body is similar to that of the cock, being broad and massive; but her comb is very small in comparison, while her crest is full, compact, and of globular shape, the feathers forming it not being long and drooping like those of the male bird. Fully matured cocks scale 9 lb. and hens 7 lb.

Varieties, Colour, and Markings. Although only one variety, the Black, is standardized by the Poultry Club, there have been two others, namely, the Blue and the White. The plumage of the first-named is lustrous green-black, and no other colour is admissible, except a few white feathers in the crests of adults, which, however, are not desirable. The Blue is possibly bred from the other two varieties, and its colour is more of a slate than a blue, similar to the Andalusian fowl. The beak is dark horn; the eyes are bright red, although black is permissible, while the comb, wattles, and ear-lobes are red; but the legs and feet may be black or slate-blue.

Utility Properties. Its chief recommendation from

a utility standpoint is its suitability for table purposes. The flesh of the Creve-Cœur is very tender, and there is plenty of it on the breast; but owing to the dark colour of its legs, the breed does not appear to be a favourite here, our English tastes in table fowls being for birds with light-coloured shanks. The females are sitters and moderately good layers of rather big white-shelled eggs; but the birds are somewhat delicate and must be well protected from winds and cold rains. They can be easily kept in confinement, and will thrive satisfactorily in a warm and dry climate. Nevertheless, poultry-keepers in this country have never taken kindly to crested fowls.

Standard Requirements. Since head points total up to 45 per cent—30 per cent for crest and muffling, and 15 per cent for comb—it is not surprising that fanciers aim for perfection of these parts for show purposes. Size, however, is somewhat important, as 20 per cent is allowed for it, while colour gets 15 per cent, and type and condition 10 per cent each.

The Croad Langshan (Sitter)

Although the breed bearing this name is a Langshan —the "Simon pure" of all Langshans—and, taken alphabetically, should perhaps be dealt with later in this chapter, it has for so many years been classified by its Christian name that in such order must I consider it. The Croad Langshan was among the first of the layers of dark brown eggs to reach this country in the old days. At one time it had a great vogue; but such is not the case now, although it is still popular. Throughout its long career it has been cultivated much more as a utility breed than an exhibition fowl. For many years, too, there has been a specialist club to look after its interests; and the object of that club is "the perpetuation and extended cultivation of the breed of Langshan fowls" introduced in 1872 by the late Major Croad. In such circumstances, therefore, the breed should have forged ahead; and, with the increasing demand of recent times for "rich brown eggs," it should now be most popular with poultry-keepers. This, nevertheless, it is not. To cater for the demand for eggs with dark brown shells, English breeders had to import the Barnevelder, and, later, the Welsummer. But it was from the Langshan that these two Dutch breeds inherited the power to colour their eggs with a dark brown pigment.

Had the Croad Langshan been allowed to fade out of the picture, so to speak, its present somewhat lowly position among popular breeds might have been understood. But this has not been the case, because the specialist club has never been allowed to lapse. The fact remains, however, that comparatively few present-day utility poultry-keepers know as much about the breed as to specialize in it for commercial purposes. It may be that those who breed it have been content to hide their light under a bushel. On the other hand, I cannot help thinking that revising the standard and setting out the various points in such minute detail as that shown in the club year-book have done more harm than good. A simple standard appeals much more to the masses than does one with a lot of unnecessary detail.

FIG. 154. A CROAD LANGSHAN COCK

Of its origin all I need remark is that the breed came from the Langshan Hills in the North of China, and it was said that the Chinese claimed it as being allied to the wild turkey—which, however, is not so. The breed was imported into England early in 1872 by the late Major Croad, of Durrington, Worthing, Sussex, while the first specimens of it ever exhibited in this country were on view at the Crystal Palace (Great National) show of that year. They were known as Langshans. Some authorities insisted on their being Black Cochins. But, while both of these breeds hailed from the East, there is no reason to doubt that they are as distinct as are Cochins from Brahmas.

The prefix "Croad" was necessary to distinguish the original Langshan fowl—as introduced from China by the late Major Croad—from a later type

which was developed in England into what is generally now called the Modern Langshan, although this latter is known in the Fancy simply as the Langshan. However, so far apart are these birds, the Croad Langshan and the Langshan, that each has its own standard, while both standards are recognized by the Poultry Club.

FIG. 155. A CROAD LANGSHAN PULLET

General Characteristics. The breed belongs to the general-purpose group; and according to its standard weights it verges on the heavy side—the adult cock not less than 9 lb. and the fully-grown hen not less than 7 lb. The cock's body is moderately long and deep. His back is broad, but flat across the shoulders, and his saddle rises abruptly to the tail. His breast is deep, full, and well rounded, the breastbone long, and the keel slightly rounded. The wings should be carried high, although a low carriage is allowed; but the latter is not in keeping with an active fowl. And this applies to the female as well as to the male. The cock's tail is fan-shaped—the feathers spread out rather than held closely together and "whipped"—and carried fairly high, with the two sickles some 6 in. or more above the remainder, and the top curve of them level with the cock's head when the bird is standing at attention.

In the fully-furnished cock the hackles of the neck and saddle should be so full as to give the back (profile view) a somewhat short appearance, which is greatly accentuated by the abrupt rise of the saddle. The head is neat, somewhat small, and full over the eyes, but the eyes are large and intelligent. The face is smooth and free of feather, while the comb is single, upright, inclined to be small, fitted with five or six spikes, and the back of it straight out and not following the curve of the skull. The ear-lobes are well developed and pendant, and the wattles somewhat small. The neck is of medium length and profusely covered with hackle feathers, reaching over the shoulders and almost meeting the saddle of the bird.

The legs are of medium length—"sufficiently long to give graceful carriage to the body," according to the Standard. The thighs, covered with rather soft feathers, must be long enough to allow the hocks to stand clear of the fluff. The shanks, small-boned and well apart, should be lightly feathered (groused) down their outer sides to the ends of each outer toe, while the toes (four) are long, slender, and straight.

The hen carries rather more abundant fluff than the male bird, while her cushion is fairly full but not obtrusive, and her back does not appear to be as short. The carriage of both sexes is graceful and active.

The standard weights are mentioned above. It is said in the Poultry Club's Standard that "in fowls of such remarkable merit for table purposes, size, consistent with type, must be a great consideration." Hence the suggestion that the adult cock should weigh not less than 9 lb. Now in my experience this is a mistake. The Langshan was not imported solely as a table fowl or as a bird to vie with our own market breeds. Moreover, the Club's own Standard—revised in 1924 by those who claim to be utility experts—insists on the bone being "medium or rather fine." In addition to this a Croad Langshan is a general-purpose breed. Consequently "not less than" might well be "not more than" 9 lb. It may be as well to remark that in Australia, where the Croad is known as the Chinese Langshan, there are to-day some strains which are among the best of layers, while maintaining sufficient of their original properties to breed decent cockerels for the table.

Varieties, Colour, and Markings. Up to the present only one variety, the Black, is recognized by the Croad Langshan Club. But a Blue has been exhibited, a true Croad in general characteristics, while there is no reason why a White should not be developed. However, in the Black the surface colour of the plumage is dense black with a brilliant beetle-green lustre, free from purple or blue tinge. In fact, an appreciable amount of purple or blue barring, or decided tinge of either shade, is highly objectionable. The colour and

markings of the Blue variety are similar to those of the Andalusian. In both cocks and hens the beak is light to dark horn, preferably light at the tip and streaked with grey. The eyes are brown to very dark hazel, the darker the better, but not black. The comb, face, wattles and ear-lobes are of a brilliant red. The legs and feet (the shanks and toes) are blue-black with pink between the scales; the webs of the feet and the soles are pink-white—the deeper the pink the better—and the toe-nails white.

It is worth noting that in old birds the shanks and toes are nearer blue than black, while in young ones the scales are nearly black. The pink is most prominent on the back and inner sides of the shanks. What may be termed the leg colour is standardized as an important point in Croad Langshans. Thus, yellow in any part, black or partially black soles, black spots under the feet, and dark or black toe-nails are serious defects.

Utility Properties. Fowls of "such remarkable merits for table purposes" may be the opinion of those who framed the standard for the Croad Langshan. But it is not that of practical men who have to deal with market salesmen; and pure Croad cockerels for table do not fetch very remunerative prices for the producer when so sold. Admittedly, the Langshan is a thin-skinned fowl; so much so that one has to be particularly adept at plucking dead poultry to avoid tearing the skin of a young bird which is being prepared for table. It also carries plenty of flesh on the right parts. Moreover, the flesh is white, the skin is white. But, while cockerels can be induced to put on weight by special feeding, their black shanks and the feather thereon do not tempt salesmen to offer top prices for Croads as table chickens. Hence it would be folly to specialize in the breed for market, except for people who appreciate quality and know that, when trussed for the oven and with the shanks removed, the fowl dresses well. It certainly eats well—the flesh is of particularly fine flavour.

Then, as regards laying qualities, the Croad Langshan produces medium-sized eggs, while the tints of the shell vary from the palest salmon to the darkest chestnut brown. Indeed, some eggs are spotted and others splashed, while the same hen may tint her eggs differently one day from another. These points are mentioned in a book on Langshan Fowls by Miss A. C. Croad; and although that book was written many years ago, I know from personal experience that the facts mentioned still hold good. The Croad Langshan never was a layer of big eggs; but I have never yet found it difficult to dispose of them to consumers. The excellent colour of their shells and their particularly good shape and texture appeal to discerning buyers, so that remunerative prices are readily obtained for them.

It is many years since I first kept Langshans, genuine Croads; and without doubt they are among the best of the general-purpose breeds existing to-day. They thrive practically anywhere, at free range or in confinement; and they are hardy enough to be kept profitably on heavy land and in exposed situations. The hens make ideal mothers. They are docile to handle, sit closely, and look well after their chickens. The chickens, too, are hardy and give no trouble when properly managed. The cockerels make good table birds at three months or so, carrying plenty of breast meat and having white flesh. March-hatched pullets can be brought into lay in late autumn and can be depended on to produce plenty of winter eggs. And what is more, the hens can be kept on as layers to a greater age than many of the more recent breeds.

With all these good points it is, perhaps, difficult for the novice to understand why the Croad Langshan has not retained the position it once held in the very front rank of popular breeds. In my opinion much of its drop in popularity as an exhibition fowl is due to the too exacting demands of the present standard. However, it has many economic qualities for the utility poultry-keeper. It lays well and "eats" well. It is a good forager, yet contented in a confined run. It is hardy, an easy fowl to manage, and responds to good treatment. There are many worse but few better general-purpose breeds than the Croad Langshan.

For Sex Linkage. Being black, the male can be linked with any barred variety of hen—the Barred Plymouth Rock or Wyandotte, the Scots Grey, or the Cuckoo Dorking. However, well-selected Croads will give satisfaction for general purposes, so there is no need to cross them.

Standard Requirements. Size and type account for 65 per cent of the points allowed in the Standard, and this total is made up as follows: type, girth, head (and feet), 15 per cent each; frame (and bone), abdomen (and pelvis) 10 per cent each. A much more simple division would have been to allow type 35 per cent and size 30 per cent. To complete the hundred, colour is pointed as 15 per cent, "furnishings and footings" and condition, 10 per cent each. The Croad Langshan is a most suitable breed for beginners who wish to exhibit fowls, because it needs very little preparation for the show pen.

The Dorking (Sitter)

The Dorking is one of the oldest of our domestic breeds of poultry and essentially an English fowl. In bygone years it was seen in practically every farmyard and homestead in the south-eastern counties. But to such an extent has its glory departed that it

is almost unknown to, and certainly untried by, the rising generation. Like the Cochin, it is a breed which has had its ups and downs, and many more downs than ups during the past thirty to forty years. And yet there is in it that which should ensure for it a large degree of popularity, except among those who seek for the super layer only.

Granted that one seldom comes across a flock of Dorkings nowadays working the home fields or ranging

FIG. 156. A SILVER DORKING HEN

freely where cattle feed, because, unfortunately, most specimens of this fine old breed to be met with are penned for competition at shows, and this but seldom in the south of England. Yet so hardy is it even to-day that it thrives north of the Border, whence some of the very best Dorkings in the world are to be obtained. In my young days I have seen these fowls in goodly numbers on farm and estate, although few people keep the breed to that extent now.

Its origin is wrapped in obscurity. Some writers claim to have traced its history back for many ages. And there are those who say that the Dorking is the fowl referred to by that very ancient authority on poultry, Columella. He it was who, when describing the points to be observed in selecting stock, mentioned the large and broad chest, the square frame, and the five claws, which are, admittedly, special points in the breed as it is known to-day. On the other hand, there are writers who maintain that the Dorking originated in the farmyard fowl of long ago —the old Kent, Sussex, and Surrey five-toed fowl of the homestead—and that ever since it was called a distinct breed it has been so crossed as to render the present-day type merely a mongrel.

In the early part of last century there appears to have been more than one variety of five-toed fowl. Such as Greys and Tawneys were much in evidence, while there was mention of a "White-Spangled Black-Breasted Bright Red Old Kent and Sussex five-toed hen." However, for all practical purposes the Dorking is the five-toed fowl of the south-eastern counties of England and took its name from the town of Dorking in Surrey. And although the present-day stamp differs in some characteristics from the "old style prize" Dorking of 1853, it still remains the Dorking.

General Characteristics. The Dorking is one of the few essentially English breeds, and is classed in the general-purpose and heavy group of fowls. No matter what its variety or colour, the true Dorking is a massive-bodied bird, long and deep, and almost of rectangular shape when viewed sideways, while, contrary to the generally accepted opinion, its feathering is tight and not "hollow" and fluffy. The breast is especially deep, broad, and well rounded, and the keel-bone long and straight. The back is broad and moderately long, with (in the male) a full saddle inclined downwards to the tail. The wings are large and well tucked up, and the cock's tail is full and sweeping, carried well out, and furnished abundantly with side-hangers and broad sickles. A high or squirrel tail is objectionable. With it all, however, the plumage is close.

In both sexes the legs are short, strong, clean, and straight, the thighs almost hidden by the body feather, the shanks round, and the spurs set on the inner side and pointing inwards. The feet are five-toed, round and hard, a defect in the breed being "spongy" feet. The front toes (three) are long and well spread, while the hind toe is double. But the fourth, inclining towards the ground in a natural position, must be distinct from the fifth. This last, starting from close to the other and running at first at right angles with the shank, must turn upwards.

The head is large and broad-skulled, the beak stout and slightly hooked, and the eyes are full. The comb varies in conformation, according to the variety, as mentioned below. On the cock the single comb is fairly large, evenly serrated, firmly set on the skull and carried upright, while on the hen it is of medium size and falls slightly to one side. The rose comb is square-fronted and moderately broad, narrowing behind to a slightly upturned spike or leader. The top of it is covered with small coral-like spikes of even height. The face is smooth, the ear-lobes are well

developed, and the wattles large and long. The neck is somewhat short, and the cock's is abundantly furnished with hackle to give it a broad appearance where it joins the body.

Adult cocks scale 10 lb. to 14 lb., cockerels 8 lb. to 11 lb., and hens 8 lb. to 10 lb. In the Cuckoo, Red, and White varieties, however, the weights are generally 2 lb. to 3 lb. less.

Varieties, Colour, and Markings. According to the Poultry Club Standard there are five varieties of this breed, and they are the Cuckoo, the Dark (or Coloured), the Red, the Silver-Grey, and the White. Others may have been attempted; but if so, they have escaped my notice. It is interesting to note that in the first and last-named varieties, the comb must be of the rose type only, in Reds and Silver-Greys single only, but in Darks single or rose.

Although five varieties are standardized, there is no need to go into a minute description of them all. White is practically the same all through the breeds —snow-white, free from straw tinge—while Cuckoo is dark grey or blue barring on light blue-grey ground, the colours shading into each other rather than being distinctly cut. The Red is a Black-Red as regards the male bird, viz. hackles glossy red, back and wing bows dark red, and the remainder jet black with green gloss. But the hen—except her black striped gold hackle and black tail—is red-brown, each feather tipped or spangled with black, and having a bright yellow or orange shaft.

The Dark (or Coloured) cock has black breast, under-parts and tail, which colouring applies also to the Silver-Grey cock. But in other respects they differ. In the former the hackles are white or straw more or less striped with black. His back may be grey, white, or black-and-white of almost any shade, mixed with maroon or red. His wings are white mixed with grey or black, with a glossy black bar across the middle.

The Dark hen's breast is salmon red, each feather tipped with dark grey verging on black. The remainder of her plumage (except the tail, which is nearly black but with outer feathers slightly pencilled) is rich dark brown approaching black, each feather slightly pale on the edges and showing a dull white stripe (shaft) in the centre. Some Dark hens, it may be mentioned, have body feathers with brown-grey pencilling in the centre and outer lacing, while others show colour on their wings—brown-grey centres covered with "a small, rich marking, surrounded by a thick lacing of the black."

The Silver cock's hackles and back are silver-white, free of stripe or colour, and his wings are silver with glossy black bar. For colour and markings few fowls surpass the Silver Dorking hen. Her hackle is silver-white, the lower part finely striped with black. Her breast is rich robin red, or salmon red, ranging to almost fawn and merging to ash-grey towards her thighs. Her body is clear silver-grey, finely pencilled with darker grey. The marking must follow the outer line of the feather, and not go across it, while the colour must be free from red or brown tinge or black dappling. A special note in the Poultry Club Standard is, "the effect may vary from soft dull grey to bright silver-grey, an old-fashioned grey slate best describing the colour."

As regards the head, etc., of all varieties of the Dorking, the beak is white, the eyes are bright red, and the comb, face, wattles, and ear-lobes coral red. The legs and feet (including nails) are white, "a delicate white with a pink shade," but without red on the sides of the shanks or pink between toes. Ivory white is ideal.

Utility Properties. Despite its long and close association with the south-eastern counties of England, the Dorking is hardy enough to thrive almost anywhere. Away North and far beyond the Border, as well as in Ireland, America, and most parts of the world, it has been and is reared to perfection. The birds give most satisfaction when kept on a dry soil; and this should be borne in mind when selecting stock. Nevertheless, they are by no means delicate, as some people have been led to believe; and they thrive well where other and supposedly more robust breeds have failed.

As table fowls they fill the bill to a nicety. In this respect they are unexcelled, and they justly deserve the high reputation they have gained as market birds. It cannot be said that the females are great layers, but when bred for that purpose they will keep on steadily throughout winter. They produce eggs of good size, the shells varying from cream to almost dark brown. Both pullets and hens are reliable sitters. Still, on account of their five-toed feet, they are not chosen for broodies by all poultry-keepers. Some say they are clumsy when on the nest, breaking eggs and crushing chickens; but Dorkings have often been used by me with success for hatching and rearing. Birds of this breed can be kept in confinement. The best returns in eggs, however, are secured from those which are allowed a wide range.

Standard Requirements. The chief points aimed for in exhibition specimens are type and size, and, in the Silver-Grey and Red varieties, colour; but the percentage of points differs. For instance, taking these three sections in the order named, the percentages are as follows: in Darks, 20, 28, and 12; in Silvers and Reds, 12, 18, and 24; in Cuckoos and Whites, 20, 15, and 15. In all five varieties, however, much importance is attached to correct feet and the proper

formation and development of the fifth toe. Spongy or crooked toes or swollen feet are objectionable; distinct double nails are among the serious defects; while few judges would overlook fifth toes so faulty as to be carried in line with the fourth, instead of turning upwards. The condition of the feet is allowed 8 per cent, and the formation of the fifth toes 15 per cent in Cuckoos and Whites, and 10 per cent in the other varieties of the breed. The other sections are head points and the general health of the specimens exhibited, the former varying from 10 per cent to 17 per cent, and the latter from 10 per cent to 12 per cent.

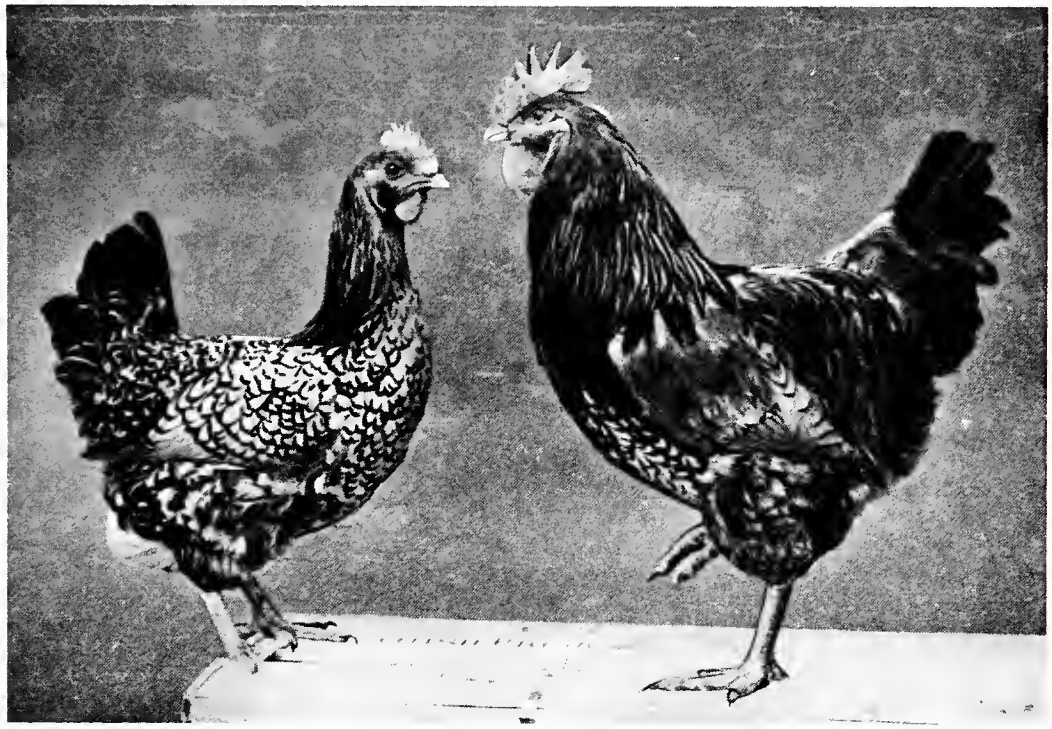


FIG. 157. GOLDEN ESSEX FOWLS

Representative specimens of this recently introduced breed, which is fully described in the text

The Golden Essex (Sitter)

At the February, 1933, meeting of the Poultry Club Council it was decided "that the Golden Essex . . . has reached the stage at which it can be admitted to the Standard." This meant that it had satisfied the council as to its suitability to be recognized as a distinctive breed, viz. that at least 50 per cent of the progeny bred true to type and colour, i.e. possessed the general characteristics of the breed. It first attracted my attention by being entered in the Essex County Laying Trials, and I got into communication with the originator (Mr. F. N. Sorrell, of Little Bentley, near Colchester) for particulars concerning it. The Golden Essex was started by crossing Rhode Island Red hens with Croad Langshan cocks, and then mating their female progeny with Barnevelder cocks. The over-cross naturally produced birds varying in colours and markings; but among them were some which were golden-laced, and they were chosen as the basis of the new breed. For eight to nine years these birds were being very carefully selected and mated for the ideal; and so satisfactory is the result that Mr. Sorrell assured me, in 1933, they bred 94 per cent true. This is a remarkable achievement, and shows how well the general characteristics were established before permission was asked to include the fowls as a standard breed.

General Characteristics. The Golden Essex is a general-purpose breed, but on the light rather than on the heavy side, and, of course, English. The cock's body is long, broad, and fairly deep, and somewhat similar in shape to the Barnevelder, which has already been described. The legs are fairly short, the thighs fleshy, the shanks (free from feathers) strong without coarseness, and the toes (four) well spread. The carriage is upright and active, the plumage close. The hen's body is well balanced with plump breast, somewhat long and flat back, and deep through the stern. Adult cocks scale about 7 lb.,

cockerels 6 lb., hens about 5 lb., and pullets 4½ lb. to 5 lb.

Variety, Colour, and Markings. As the name denotes, there is only one variety, the Golden. The cock's neck-hackle is black, striped with red-gold and finishing with a black cape. His breast has red-gold ground colour with glossy black single lacing, i.e. the black takes the form of edging around each feather. His back, saddle, and wings are red-gold, not laced, his tail is glossy black, and his thighs are gold with black lacing. The neck-hackle of the hen is similar to that of the cock, and so is her tail, but the remainder of her plumage is red-gold with glossy black single lacing. The colour of the beak is yellow to horn; the eyes are bright gold with black pupil, the comb, face, ear-lobes and wattles red, and the legs and feet yellow.

Utility Properties. The originator assured me that the pullets lay remarkably well and produce brown-shelled eggs of good weight, while the cockerels can be developed into "plump killing chickens." The breed is a hardy one, and the chickens are good growers. These, I am told, when hatched are "black on the back with grey breast and brown head."

Standard Requirements. As the breed was brought out for utility, the scale of points includes "indications of productiveness" 25 per cent. A similar percentage of points is allowed for colour and markings, while size and type combined get 20 per cent, and head points, legs (and feet), and condition are allowed 10 per cent each.

The Faverolles (Sitter)

Why the Faverolles is not a popular breed in this country—and outside the show pen, it is scarcely known to the average poultry-keeper to-day—may not be apparent to the handful of enthusiasts who specialize in it. They claim, and not without good reason, that the breed possesses satisfactory utility properties, while, taken generally, it is not among the most difficult fowls to produce for exhibition. Nevertheless, although it has something of a vogue in the middle and south-western counties of England, it cannot be said to be very extensively cultivated.

Writing of the breed in 1886, an old friend of mine described how he went in quest of the Faverolles, as it had been recommended to him as the choicest table fowl to reach the Paris markets. He had been informed that the bird really at home at Houdan was not the Houdan itself, but another variety called the Faverolles, and that the table poultry sold in the Houdan market were chiefly of this breed. Visiting that market, however, and making anxious inquiries, he could find no actual specimen, except a few birds of a light buff colour, which were said to resemble the Faverolles. Many of the peasantry who had fowls for sale knew there was such a breed, and suggested that specimens of it could probably be secured in the villages of Faverolles. All that could be found, though, were birds of a light buff colour, with thin whitey-pink skin, and white legs, which had very few feathers on them. They were certainly not a cross between a Houdan and a Brahma, or a Houdan and a Cochin.

FIG. 158. A SALMON FAVEROLLES HEN

Now, since the Faverolles is said to have been evolved from the Houdan, the Dorking, the Brahma, the Cochin, the Malines (Coucou), the Plymouth Rock (Barred), and the Croad Langshan, it can be imagined that there was nothing very definite about it at first. As a matter of fact, several types existed; and it has been only of comparatively recent years that any attempt has been made to breed it to a fixed standard. In my early days in the Fancy, I recollect the Faverolles-Dorking or Faverolles-Salmon, which, it may be noted, is the foundation of the present English type. Some of the varieties had single combs and others rose combs, while some had muffling and others were without that adornment.

As it was, though a type was fixed for English breeders, a standard for it, the Salmon, was given in detail in a book I wrote in 1909; and that standard, even for colour and markings, differs only very slightly from the one which obtains to-day. Like so many other Continental breeds, the bird was bred solely for market. It was the common fowl—though to fanciers a mongrel—in the village of Faverolles; and it was gradually evolved without any definite desire

on the part of breeders to establish a new breed, as they had in view the production of good table chickens and winter eggs.

General Characteristics. The Faverolles is a French fowl of the general-purpose class, leaning more to the market chicken side than to egg production, but a reliable layer when bred with that object in view. It was produced to supply fowls of a good all-round type for the poultry rearers of France, and it is the heaviest of the French breeds to be cultivated in our country.

The body of the cock is deep and square—"cloddy," according to the Poultry Club Standard—his back being very broad across the shoulders and saddle, fairly long, and somewhat resembling the Dorking, although hardly as massive, perhaps. His wings are small and carried closely, while his tail is moderately long and somewhat upright, with broad sickles. Long, thin and flowing tails, either low or on a level with the back, are objectionable. His legs are stout and fairly short, well apart, the shanks being very lightly feathered down to the outer toe, while his feet are of the Dorking type, that is, five-toed, and the fifth toe carried upward.

The head is broad and free of crest, the comb single, of medium size and carried upright, the beak stout and short, and the eyes are prominent. Face muffling is a feature of the Faverolles. The beard and whiskers are full, wide and short, somewhat similar to those of the Creve-Cœur, but the beard is short. The ear-lobes and wattles are small and almost covered by the muffles. The neck is thick and short, but not such as to give the bird other than an active and alert carriage. The Faverolles is a good forager.

The hen's body is longer and deeper in comparison, her comb smaller in proportion, and her tail shaped like a fan, furnished with broad feathers of medium length, and not carried as high as that of the cock. Standard weights are as follows: Cock, 8 lb. to 10 lb.; cockerel, 6½ lb. to 9 lb.; hen, 6½ lb. to 8½ lb.; and pullet, 6 lb. to 8 lb. However, cocks of 9 lb. and hens of 7 lb. are heavy enough for work.

Varieties, Colour, and Markings. Only four varieties are mentioned in the Poultry Club Standard, and they are the Blue, the Buff, the Salmon, and the White. Nevertheless, there have been a Black, a Cuckoo, and a Light; in fact, these latter were among the originals. Four varieties are standardized, but only one, the Salmon, needs describing. The Blue is medium slate, laced a dark shade (like the Andalusian), the Buff is rich lemon, and the White is free from straw tinge. In the Salmon the cock's muffling is solid black, as are his breast, thighs, under-fluff, tail and shank feathering, but his hackles are straw-coloured. His back, shoulders and wing bows are a bright cherry mahogany, but the wing bar and primaries are black, the secondaries being white on the outer edge and black on the inner and at the tips.

The hen's muffling, breast, thighs, and fluff are cream. The remainder of her plumage is wheaten-brown, her hackle being striped with a dark shade of that colour (not black) and her wings lighter and softer. In the Blue the beak is black, the eyes may be black or brown, and the legs and feet black or blue. These parts in other varieties are horn or white (beak), grey or hazel (eyes), and white (legs and feet). But in all Faverolles the comb, face, wattles, and ear-lobes are red.

Utility Properties. Brought out for the production of table chickens and those which will "come to market quickly," the breed may be said to answer to what the "Surrey" or Sussex bird does in England. It will, if required, stand the confinement of a fattening coop, and can be fed and crammed to good weights. But, despite its excellent qualities in this respect, it has not caught on in England. The chickens are hardy, easy to rear, grow quickly, and make suitable market birds; they are good foragers. The hens are sitters and very fair layers of average-sized tinted eggs. When they are spring-hatched the pullets produce plenty of eggs in winter, and they can be profitably kept even in the changeable climate of England.

Standard Requirements. Colour is a strong point for exhibition birds of this breed, and 25 per cent is allowed for it. Type, however, and muffling each get 20 per cent, while size is allowed 15 per cent, and comb and condition 10 per cent each. Thus, the most important part of the Faverolles is its head, i.e. muffling and comb combined equal 30 per cent.

The Frizzle (Sitter)

Some people imagine that Frizzles—those quaint fowls with feathers curled towards the head, as though the birds were for ever turning tail to high winds—are just freaks, and that there is no evidence that frizzled or curled-back plumage is a distinctive character of any particular breed. But a freak is an abnormal production of Nature, a monstrosity. There is as much reason to suppose that the Danubian or Sebastopol goose is a freak because its plumage is of a peculiar character—the feathers of this breed of waterfowl, except those on its neck and breast, are long, slender, frizzled, and silky, while many of them trail on the ground—but it is the breed's natural covering, just as the curled feathering is the natural plumage of the Frizzle fowl. Hence, because the fowl, like the Silkie, for instance, differs from the general run of denizens of the poultry farm in the matter of plumage, it can scarcely be termed a freak. As a

matter of fact it is a very old-established breed and came originally from Jamaica, although fowls with such plumage are to be found in Switzerland and the North of Italy, and even among the common or barnyard stocks of those European countries. I am told that the natives of Jamaica declare that Satan, being hungry, tried to snatch a hen from her perch but just missed her, with the result that the feathers

FIG. 159. A SPANGLE FRIZZLE COCK

turned on end with horror. However, the feather is natural, and there is little fear of the curl disappearing by exposure to rain.

General Characteristics. The Frizzle has been established in England as a standard breed. It belongs to the general-purpose and heavy group of fowls. The cock's body is broad and long, his breast full and round, and the wings are long. His tail is large, erect, and full, but with long sickles and plenty of side hangers. His head is fine, the beak short and strong, the comb single, of medium size and carried upright, and the face smooth. His eyes are prominent and bright, and his ear-lobes and wattles of moderate size. His neck is of medium length and abundantly frizzled. His legs are moderately long but not stilty, his shanks free of feathers, and his toes (four) thin and well spread. The whole carriage is erect and strutting, and his plumage is moderately long, broad, and crisp, each feather curled towards the bird's head, and the frizzling close and abundant. The hen's comb is much smaller in proportion, while her neck is not so profusely frizzled. The standard weights are as follows: Matured cock, 8 lb.; cockerel, 7 lb.; hen, 6 lb.; and pullet, 5 lb.

Varieties, Colour, and Markings. There are several varieties such as Black, Blue, Buff, Columbian, Black-Red, Brown-Red, Cuckoo, Duckwing, Pile, Spangle, Red, and White. In the "self-colours" the plumage must be of an even shade throughout, while in the others the colour and markings should be similar to Old English Game. In all varieties the eyes are bright red, and the comb, face, wattles, and ear-lobes the brilliant red of a healthy fowl. The leg colour may be yellow, dark willow, black or blue, while the beak should match the legs.

Utility Properties. The hens are sitters, although by no means troublesome in this respect, and they are good layers of brown eggs. The breed is a hardy one and the chickens are easy to rear, while the cockerels plump well for table purposes.

Standard Requirements. Although "curl" is scaled as 30 per cent, it is the chief point in show birds. Type and colour each get 25 per cent, and condition and weight 20 per cent. Colour counts for little with most judges. The most important point when showing Frizzles is to exhibit birds with plumage like "nigger hair curl," because the more distinct and abundant the curled feathers, the greater chance is there of the specimens being awarded prizes.

Game, Old English and Modern (Sitters)

As cultivated to-day, the Game fowl is of two distinct classes, in fact, three, because, while there are Old English and Modern, of the former we have the show type and the Pit—the old English Fighting Fowl. Like the Dorking, the Game is one of the oldest of the pure-bred English fowls; but there seems to be little doubt that it is directly descended from *Gallus Bankiva.* Such, at any rate, is the accepted progenitor of our Game. For very many generations the breed has been kept and carefully bred to fixed standards in this country, while there is no question that, even to-day, the world's best Game fowls are bred here.

OLD ENGLISH

In bygone times, when "cocking" was listed as a legitimate sport—and encouraged, moreover, by the highest and most noble personages in the land—the Game cock was bred for his pluck and courage; he would die rather than "turn tail and run." However, now that cock-fighting is prohibited by law, the colour and markings of the plumage and quality of flesh have taken the place of fighting propensities in many

exhibition strains. As can be readily imagined, the Pit or old fighting type is different from the present show bird stamp, and this is particularly so when the cocks are compared.

One old writer has described the former as proud and upright, with small head like that of the sparrow hawk, having a strong beak, hooked, and big at the setting-on; eager, bold, dilated eyes, full of defiant gaze, unflinching, and undaunted; round-breasted

FIG. 160. A BLACK-RED OLD ENGLISH GAME COCK, DUBBED FOR EXHIBITION

and muscular; wings "like those of the eagle," tail high, plumage "as hard as flint," and bone small. Such then were, and indeed are, the chief points of "the cock of the Game, a monarch bird." Some authorities assert that the specimens now exhibited —the show Game as against Pit Game—have a more thoroughbred appearance about them than the old; yet others affirm that the new type is a mongrel in comparison.

THE MODERN

When cock-fighting was banned as illegal, and in the early days of poultry shows, fighting strains found their way into the exhibition arena. Hence, as their many beautiful points were brought more and more prominently before the general public, there entered into the ranks of exhibitors those who bred the birds solely for show. Although they would have nothing to do with the illegal sport, they strove to produce specimens which, conforming in certain points to the Pit birds, would nevertheless be distinct from them.

Consequently, the type of the old Game fowl was gradually changed. And to such an extent was this carried on by some fanciers that the fashion was set for birds with more reach; so that in many strains the original was well-nigh obliterated, and the new, the Modern Game, came to the front. For many years these reachy birds continued to have a great vogue, but eventually their popularity waned, no doubt owing to the revival of the Old English.

THE THREE TYPES OF GAME FOWL

General Characteristics. Here it is necessary to part the ancient from the modern; and even the general characteristics of the Old English differ in some points according to whether the birds are of the old (fighting) type or the new (show) stamp. Dealing first with the old-fashioned Game cock, his neck is long, the hackle feathers short and very close, not flowing over the shoulders. The junction of the neck with the head is strong, but the latter is small and flat. The under mandible and throat are lean and red, and the upper mandible somewhat Roman, ending sharply. The eyes are large, bold, and prominent, full of expression. The comb is single, small, upright, and of fine texture, and the ear-lobes and wattles are fine and small. It is, however, customary to dub Game cockerels, that is, to remove the comb, wattles, and ear-lobes, and this leaves the head and lower jaw smooth and free from ridges.

His body is short and flat-backed, broad at the shoulders and tapering to the tail, and the breast broad, full, and prominent, with large pectoral muscles, breast-bone not deep or pointed, and stern lean and tight. His wings are large, long in the pinion, and powerful, not set too high, and his tail is large, carried upward (though not squirrel), and spread, the main feathers and quills large and strong. The legs are strong, the thighs short, round, and muscular, as though encased in a silk stocking, i.e. not a loose or long feather on them, and as hard as "a blacksmith's deltoid." The shanks are round-boned, sinewy, and close-scaled, and fitted with hard and fine spurs, set low. The toes (four) are long and well spread, the fourth (or hind) one straight out and flat on the ground.

The covering of the bird is a homogeneous thin mass of feather, hard, compact, firm, and so mail-like that grain suddenly thrown on the cock's back should rattle and recoil as if it were from parchment. His carriage is bold and sprightly, and his handling "corky," with plenty of muscle and strong contraction of the wings and thighs to the body. The hen matches him in symmetry, the feather being extremely tight. Her tail, too, is inclined to be fan-shaped and carried well up.

As to weights, those given in the Poultry Club

Standard are, for the cock 5½ lb. to 5 lb. 10 oz. (it is considered undesirable to breed cocks over 6 lb.), and for the hen 4 lb. to 5 lb. But an old authority says of the male bird, "About 4½ lb. is nearly the weight; 5 lb. is certainly very far up the mark, for practical purposes decidedly."

With regard to the new, the present-day show type of Old English Game, the neck-hackle is profuse, and covers the shoulders; the tail has abundant sickle-feather, is broad and curved; the wings are inclined to meet under the tail; and the legs are "held wide apart." Generally, the plumage is nothing like as tight or the handling as muscular and firm, since the bird carries more feather.

To run briefly through the points of the Modern Game cock, it may be said that his head is long and snaky, the slight indentation over the eyes giving it that appearance. His neck is long, covered with "wiry" hackle, but thin at the junction with the body, which is short and flat, and shaped somewhat like a smoothing iron. The shoulders are particularly prominent, the wings short, and the tail fairly short, furnished with fine sickles well whipped together and only slightly curved, and carried in a more drooping position than in the generality of birds. The legs are very long, and placed well apart, the thighs firm, the shanks rounded, and the feet flat. The weights are given as 7 lb. to 9 lb. for the cock, and 5 lb. to 7 lb. for the hen.

Varieties. There are many more varieties of Old English than Modern Game standardized by the Poultry Club, the former running into a score or two, including Hennies, Muffs, and Tassells, and several kinds of Greys, Reds, Duns, Piles, and Spangles. Of Modern, however, the only ones specified or described are Birchen, Black-Red, Brown-Red, Golden Duckwing, Silver Duckwing, and Pile.

So numerous are the colours and diverse the markings of Old English Game that it is hardly possible to enter into a minute description of them. Neither is it necessary, because colour of plumage is a very small point in the judging of this breed. The varieties recognized by the Old English Game Fowl Club—whose Standard is adopted by the Poultry Club—are as follows: *Reds*—Black-Breasted Black, Black-Breasted, Shady or Streaky-Breasted Light, Brown-Breasted Brown, Streaky-Breasted Orange, and Ginger-Breasted Ginger; *Greys*—Black-Breasted Silver Duckwing, Black-Breasted Yellow Duckwing, Black-Breasted Birchen Duckwing, Black-Breasted Dark, Clear Mealy-Breasted Mealy, and Brown-Breasted Yellow Birchen; *Duns*—Dun-Breasted Blue, Streaky-Breasted Red, Dun-Breasted (Dun), and Dun-Breasted Yellow, Silver, and Honey; *Piles*—Smock-Breasted Bloodwing, Streaky-Breasted Ginger, Streaky-Breasted Custard, Marble-Breasted Spangled, Ginger-Breasted Yellow, and Dun; *Blacks*—Black-Breasted (all Black), Furnace, Brassy-Wing, and Polecat; *Whites*—Smock-Breasted Smock (or pure White); *Spangles*—Red, Black, or Brown, or a mixture of all three colours; *Cuckoos*—Cuckoo-Breasted Yellow, and Creels (creoles, cirches, or mackerels, according to different provincial dialects). Other varieties are Hennies, Muffs, and Tassells.

In connexion with the above it may be as well to remark that Greys differ from Duckwings in having their secondaries (when closed) black, or, if grey, wanting the steel-blue bar across them. Other Greys, except the Black-Breasted Dark, may have laced, streaked or mottled grey or throstle breasts. Spangles have white tips to their feathers; the more of these spots and the more regularly distributed the better. The cocks should show white ends to the neck and saddle feathers. Furnaces (or Furnesses) have golden feathers across their shoulders and are supposed to resemble a furnace; that is, the colour is said to be like flames of fire rising from a coal or black ground colour. Polecats have more red than Furnaces but it is of a lighter shade. Brassy-Winged cocks have a patch of flame colour on each wing. The Cuckoo-Breasted Cuckoo is somewhat like the Barred Plymouth Rock in markings, that is, of blue-grey colour, banded across the feathers with darker or lighter shades, while Creels have some mixture of gold or red in their feathering. Hennies (known as Hencocks) should, in their plumage, resemble hens as closely as possible; that is, their neck and saddle-hackle feathers should be rounded—not thin and pointed—their tail coverts hen-like, and the two centre tail feathers straight and not bent round like sickles in the usual way. Their colour, also, should not have the full sheen of the ordinary male bird. Muffs—which may be of almost any colour—have a thick muff or growth of feathers under the throat, altogether distinct from the muffle or beard of the Faverolles. Tassells (known also as Topins) have a small tassel or tuft of feathers on top of the head behind the comb; in the cock it varies from a few long feathers (or lark tops), extending straight out, to a tuft, but in the hen it is a more pronounced topknot, sometimes as large as a walnut, of round shape and the feathers standing almost upright but bending over towards the back, and giving them an animated and spirited appearance.

There are writers who assert that the leg colour of all varieties of the Old English Game should be pure white. But this is not so; and some of the very best birds ever bred have had coloured legs. One thing, however, appears to be insisted upon in this direction, viz. in all varieties except the Spangle (in which the

legs may be mottled, though they seldom are) the legs should be of a sound self-colour, and this may be black, blue, olive, white, yellow, or willow. The eyes must be alike in colour, but this colour may be daw, pearl, or red of various shades. In the Standard above referred to, there is a note, viz. "It is desirable that the toe-nails should match the legs and beak in colour in all Game fowls, and that legs, eyes, beak, and face match the cock in all Game hens."

Colour is a much stronger point in the judging of Modern Game, and, moreover, the half-dozen varieties of it which are standardized are specified each under its own head. The hackles (neck and saddle), back, shoulder coverts and wing bows of the Birchen cock are silver white, the neck-hackle having narrow black striping to each feather. The remainder of his plumage is rich black, except that his breast has a very narrow silver margin around each feather, giving it a laced appearance, which gradually diminishes to perfectly black thighs. The hen's neck-hackle is similarly marked to that of the cock, while her breast is also very delicately laced with silver, but the rest of her plumage is rich black.

In the Black-Red the cock's cap is orange-red and his neck-hackle light orange, free from black stripes. His back and saddle are rich crimson; his wing bow is orange and the bar black, while the primaries are black and the secondaries rich bay on the outer edge (this colour alone showing when the wings are closed) and black on the inner and tips. The remainder of his plumage is green-black. The hen's neck-hackle is gold slightly striped with black and running to clear gold on the cap. Her tail is black (except the top feathers, which should match the body colour), and her breast is rich salmon shading to ash on her thighs. The remainder is a light partridge-brown, very finely pencilled, with a slight golden tinge pervading the whole, which should be even throughout, that is, free from any ruddiness whatever—foxiness—and with no trace of pencilling on her flight feathers.

The hackles, back, and wing bow of the Brown-Red cock are lemon, the neck feathers being striped down the centre with black, not brown; and except that his breast feathers are edged with lemon as low as the top of the thighs, the plumage is black. The hen's neck-hackle is lemon at the top, but striped with black towards the bottom; her breast is laced like the cock's breast, the shoulders free from ticking and the back from lacing, and otherwise the feathering is black. Only two colours are allowed in the Brown-Red, viz. lemon and black, the former in the cock being very rich and bright, and in the hen light, while the black in both sexes should have a bright green gloss, known as beetle-green.

In the Golden Duckwing, the cock's neck-hackle is cream-white free from striping. His back, saddle, and wing bow are pale orange or rich yellow. His wing bars and primaries are black with blue sheen, his secondaries pure white on the outer edge (the white alone showing when the wing is closed), and black on the inner and tips, while the rest of his plumage is black with blue sheen. The hen's hackle is silver-white, finely striped with black, her breast salmon, diminishing to ash-grey on her thighs, her tail black (except the top feathers, which match the body colour), and the remainder French or steel-grey, very lightly pencilled with black, and even throughout. The Silver Duckwing cock has silver-white hackles, back, shoulder-coverts and wing bows, pure white secondaries on the outer edge and black on the inner with bay tips—the white alone showing when the wing is closed—and lustrous blue-black in all other parts of his body. The hen to match him is similar to the Gold hen, except that her breast is pale salmon shading to pale ash-grey, and the remainder of the plumage is light French grey with almost invisible black pencilling.

The Pile cock's neck-hackle is bright orange-yellow of one shade, neither dark nor washy. His back and saddle are rich maroon; his wing bow is maroon, the bar white and free from splashes, the primaries white and the secondaries dark chestnut on the outer edge and white on the inner and tips (the dark chestnut being the colour of the wing when closed), and the remainder of his plumage pure white. The hen is pure white—except her neck-hackle, which is tinged with gold, and her breast, of rich salmon red.

Colour of the beak, etc., in Modern Game differs according to the variety. Thus in the Birchen, the beak is dark horn; the eyes are black, the comb, face, wattles, and ear-lobes dark purple, and the legs and feet black. In the Black-Red these points are dark green, bright red, and willow; in the Brown-Red very dark horn or black (beak), and black (other parts); in Duckwings, beak dark horn, eyes ruby-red, comb, face, wattles and ear-lobes red, and legs and feet willow; and in Piles, yellow, cherry-red, red, and rich orange-yellow.

Utility Properties. From a commercial aspect, the Old English Game are splendid table birds, small certainly, but very plump. The flesh is "short"; and there is abundance of it on the breast. The carcass carries very little offal, and the bones are small. The females are close sitters and reliable mothers. Pullets are fairly good layers of tinted-shelled eggs, although the eggs are only of medium size. The chickens are exceptionally hardy and easy to rear, while they thrive on almost any soil. But they, like their parents, must have their liberty.

Of Modern Game, it may truthfully be said that they are fit only for the show pen. They cannot be considered of much account for utility purposes. It is doubtful if anyone in this country would keep them for table or as layers. Nevertheless, surplus cockerels are not to be despised for table—if old enough to be eaten—as the flesh is of good flavour. Still, the females are poor layers, and their eggs (tinted) are small, although there is sometimes a decent sale for them in a private trade.

Standard Requirements. Type is the most important point in Old English Game, since the scale allows 20 per cent for body, 10 per cent each for head and shanks (spurs and feet), 8 per cent for thighs, 7 per cent for wings, and 6 per cent each for neck and tail, a total of 67. Handling (symmetry, hardness of flesh and feather, and condition) ranks next with 15 per cent, and then carriage (action) and colour of plumage finish with 9 per cent for each. In my opinion an Old English Game cock is useless unless he displays plenty of action, and balances well on his feet, with the fourth toes straight out and flat on the ground. He should face well, with his whole legs straight when viewed from the front, that is, no inclination to knock knees.

In Modern Game, type and style are pointed as 30 per cent, and this means that the bird's body must be of the correct shape and with plenty of reach. Colour gets 20 per cent, and the remainder of the sections, viz. condition and shortness of feather, head (and neck), eyes, tail, and legs (and feet) get 10 per cent each.

The Hamburgh (Non-sitter)

Of the thousands of small men who go in for fowls, I wonder how many know anything about the breed; who among utility poultry-keepers would specialize in the Hamburgh nowadays? When it was popular in England it was referred to as the "Dutch Everyday Layer" and the "Everlasting," so prolific was its production of eggs. But from one cause or other it has almost dropped out; and rarely does one find these fowls being kept in anything like goodly numbers to-day, even for exhibition purposes. There is scarcely any need to enter into the origin of the Hamburgh. Nevertheless, as to the present day there is some slight difference in the type of the Spangled and Pencilled varieties, a few lines on the subject will show why the difference does exist.

It is generally supposed that the breed obtained its name because it was first brought to this country from Hamburgh. Now, in Wingfield and Johnson's work, "The Poultry Book," published in 1853, the following appears: "Why it should be called the Hamburgh fowl seems inexplicable, except upon the supposition that the Levant merchants residing at Hamburgh introduced it from Turkey or elsewhere, and that from Hamburgh they were exported to this country. By a similar transit," declared these old authorities, "did our black Hamburgh grapes derive their name; for they are certainly relatives of Spain, imported by the Hamburgh merchants, and first known to us as Hamburgh grapes, because purchased by us there." In the same publication, also, it is stated that: "Its earliest describer, Aldrovandus, calls it the *Gallina Turcica*, or Turkish Fowl."

Then, again, in Tegetmeier's work, "The Poultry Book," published in 1867, the author says: "There is no doubt that these fowls had originally no title whatever to the name of Hamburghs, which was, in the first instance, given to them by some gentlemen connected with the early Birmingham shows." "It is true," he wrote, "that the pencilled birds formerly were, and still are, imported in considerable numbers from Holland under the names of Pencilled Dutch and Dutch Everyday Layers. But the spangled birds appeared to be exclusively English fowls, and are essentially distinct varieties, differing in size, plumage, and in the formation of the skull."

In its early days, prior to the poultry show era, the breed was very extensively—and for some years almost exclusively—bred in Lancashire and Yorkshire; and in those counties it was known by different names. Lancashire breeders called it the Mooney fowl, and Yorkshiremen dubbed it the Pheasant fowl. For instance, the Black Hamburgh was called the Black Pheasant, and the Spangled were known as the Gold and Silver Pheasant fowls. This latter name, it was said, was given because of the resemblance of their spangled feathers to those on the breast of the cock pheasant.

In many parts of Lancashire the Spangled varieties were called Mooney fowls, from the moon-like shape of their spangles. Pencilled varieties were often referred to as Bolton Greys and Bolton Bays, from the town of Bolton, where they were for long favourites, and extensively bred. The Silver, too, was sometimes called the Creole and Creele—the latter being a local colloquialism—from the intermixture of the black and white.

General Characteristics. Let us term the Hamburgh a German breed, even though it originated in Turkey and came to England from Holland! It is, however, a light breed and a non-sitter, for seldom, if ever, have the hens been known to brood. As regards exhibition points the shape and general characteristics are supposed to be alike in all varieties, the colour and the markings of the plumage only differing. The bearing of the bird is sprightly, and its contour graceful.

The body is of medium length, fairly wide and flat at the shoulders; and the wings are large and tightly tucked. The breast is well rounded, avoiding on the one hand the thin and stilted appearance of the Spanish, and on the other the heavy and square build of the Dorking, although this latter type is sometimes prevalent, in a smaller degree, of course, in the Silver-Spangled.

The cock's tail is long and sweeping. It leaves the body at an angle of about 45 degrees, and is carried well up, but without what is known as "squirrel" carriage. The sickles almost form a perfect circle. Although having a nice sweep, they must not be carried low, which gives the bird the appearance of lacking spirit. The feathers are broad and the secondaries plentiful. The thighs and shanks—the latter free of feather—are of medium length, slender, and well rounded. Flat shins are most objectionable. The toes (four) are slender and well spread.

The head is neat, the beak short and stout and well curved, while the eyes are bold and full—keen and well open. The comb is one of the most important points, since without a good "head-piece" a Hamburgh does not look very attractive to fanciers. It is of the rose type, full of "work"—covered with small and coral-like points of even length—level on top, square-fronted, and tapering to a long, straight "pike" or leader. The ear-lobes are of kid-like texture, perfectly round and flat, fitting closely to the face—inclined to be convex rather than concave or hollow—and of good size, although not so big as to cause a tendency to white in the face. The face is smooth, and the wattles are thin, round, and free from creases and "pimples."

The hackles are full and long, meeting well over the shoulders and placed on a nicely curved neck. The plumage must be close and tight, more like that of the Game than the Cochin, as the body is compact. These points also apply to the hen, except that her comb, ear-lobes, and wattles are not as big in proportion, while her tail feathers are carried closely rather than fan-shaped. The Poultry Club Standard weights are about 5 lb. for the cock, and around 4 lb. for the hen.

Varieties, Colour, and Markings. According to that Standard there are five varieties, and these are the Black, the Gold-Pencilled, the Silver-Pencilled, the Gold-Spangled, and the Silver-Spangled. Others have been attempted, and, indeed, some fair specimens of them exhibited on rare occasions. These include a Buff-Barred, a Brown, a Buff, and a White. However, none of them has found sufficient supporters to warrant its being bred and shown to any extent.

Regarding the colour of the plumage, that of the Black is a rich, satiny, green-black, particularly striking on the sickle feathers and tail coverts of the cock. It may here be remarked that in former times it was the aim to keep the colour a purple-black, resembling that of the raven in his habitat. But in the present-day exhibition specimen any approach to bronze or purple tinge must be avoided.

The principal difference between the two Spangled varieties is that the Silver has pure silver ground colour while that of the Gold is bright dark bay or mahogany. In both of them the striping, spangling, and tipping are rich green-black. Each feather of the Silver cock's hackles, back, shoulders, and wing bows has a small tip, while in the Gold the markings resemble a stripe. Two rows of large spangles form the wing bars. On the breast and under-part the spangles are small near the throat and large near the thighs, without overlapping. The Silver cock's tail ends with half-moon-shaped spangles, and each sickle feather has a large round spangle at the end. The Gold cock's tail and sickles are green-black; they are not spangled. With the exception of the hackle—which is tipped at the top and spangled at the bottom—each feather of both varieties of hen is spangled at the end.

The markings of the Pencilled varieties are almost identical. The Silver cock is nearly white, the tips of his wings and tail excepted, which are black. His sickles, however, are green-black edged with a white fringe throughout their length, neither marbled nor splashed. The colour of the Gold cock used to be a light Vandyke brown, but it is now dark and rich, approaching maroon velvet. The Standard puts it as "bright red bay or bright golden chestnut." The cock's tail, however, is black, the sickle feathers and hangers being edged throughout or narrowly laced with gold. The hackle of both varieties of Pencilled hens is free from pencilling, except for a slight touch of black at the extreme end. The remainder of the body feathers are distinctly pencilled straight across with bars of black. This marking extends to the tips of the hen's tail, and forms regular bands around the body. The black and the intervening colour should be of the same width, and the bars as numerous and fine as possible.

In all varieties of the Hamburgh the eyes, comb, face, and wattles are red, and the ear-lobes white. In the Black the beak is black or dark horn, and the legs and feet black; but in the others the beak is dark horn and the legs lead blue.

Utility Properties. From a utility standpoint, as the Hamburgh is bred to-day, the breed is of little account. True, it was once an "everyday layer" but is not now considered commercially as an egg-producer. The females are non-sitters, and I have had those which have been really great layers. Their

eggs are white-shelled, but generally too small for present demands in the commercial line. Granted this egg size is a drawback which could be overcome by careful selection, and breeding only from matured hens which lay marketable eggs. In the Hamburgh family egg size depends to no small extent on the variety; and the Black is best in this respect.

The birds are certainly hardy, and easy to rear, and, contrary to the generally accepted opinion, when Hamburghs are fully grown, they make by no means indifferent table fowls for home use, as their bones are small in proportion, while their flesh is full-flavoured. It is as well to mention that Hamburghs fly almost like pheasants, and must be netted over or wing-clipped to be kept within bounds. They will thrive within confinement, but it is preferable to let them range. They are so active that they become "liverish" in close quarters, and lose that bright look which is one of their attractive features.

Standard Requirements. In the Black variety, head points are the most important parts to consider for the show pen, and they rank as high as 45 per cent, this total being made up of 15 per cent each for the comb, the face, and the ear-lobes. Colour, that is, a brilliant beetle-green on the surface of the plumage, is rated at 25 per cent in male birds and 35 per cent in females, which is counterbalanced by allowing 15 per cent for the cock's tail, but only 5 per cent for that part of the hen, this leaving 15 per cent only (in both sexes) to cover type, style, and condition. In the coloured varieties the pointing or scaling is altogether different. Thus, the tail of the Pencilled male bird—whether Gold or Silver—is given 35 per cent, colour and plumage 30 per cent, head (comb, face, and ear-lobes) 25 per cent, and type, style, and condition 10 per cent; but in the female the markings count as high as 60 per cent, head points 20 per cent, and colour and type, etc., 10 per cent each. For the Spangled varieties, both colours and either sex, the scale of points is the same as for the Pencilled hen. It is scarcely surprising that the Hamburgh has lost caste as a layer, because in the one variety far too much is made of head points and colour, while in the others colour and markings have been given undue importance. It has, of course, had the almost inevitable result, and driven the breed practically into the fancy class only. On the other hand, the Hamburgh is among the most beautiful breeds of poultry exhibited, the Gold-Pencilled variety being an especially charming fowl.

The Houdan (Sitter)

The Houdan is the best known of the French breeds, and one of the oldest established. Mention is made in the 1853 edition of "The Poultry Book," previously referred to in this chapter, of some Normandy fowls, which, despite the somewhat vague description given, were undoubtedly Houdans in their early stages. Of its origin not much need be said because, like most of the races of France, it was bred primarily for its utility properties. It was possibly the result of a cross with the Creve-Cœur or even with the Poland, while some authorities declare that it contains Dorking blood. On the other hand, there are those who

FIG. 161. A HOUDAN HEN

contend that it was derived from the old crested race of Caux and the common five-toed fowl which existed at the time of Columella. However, be that as it may, the Houdan, even to-day, is a useful breed for poultry-keepers who have accommodation and a predilection for crested fowls.

Very many years ago, when it was the custom to read in connexion with poultry-keeping in our country that, in all things pertaining thereto, the French were our superiors, there was a craze for French breeds. The Houdan was among those which were imported as being suitable for laying and table; and, to its credit be it said, it has outlasted other kinds which came with it. However, at the present time progressive breeders find the Bresse a much more suitable fowl for the purpose. Admittedly, the Houdan in this country has been bred so much for external points, and particularly for colour, comb, crest, and

muffling—which count as 50 per cent according to the Standard—that it has gone to pieces as a layer. So, despite what it was as a reliable producer of white-shelled eggs and as a suitable fowl for table in years gone by, I question if the Houdan is known to 5 per cent of poultry-keepers to-day.

General Characteristics. In some respects the general characteristics of the Houdan resemble those of the Creve-Cœur; in fact, with the exception of the colour of the plumage, the points of difference are few. In the shape and the size of the body, and in the head feathering, they are alike—of apparently massive build, and the head adorned with a full crest, beard, and muffling. The Houdan's feet, however, are five-toed, similar to those of the Dorking, the fifth toe being separate from the fourth, and curving upwards, while the comb is of the leaf type. This has been referred to as resembling two escallop shells joined near the base, the join covered with a piece of coral; and, again, as being like a butterfly with its wings three-parts or nearly wide open. Adult cocks weigh 7 lb. and hens 6 lb. according to the Standard; but compared with present-day specimens these weights are somewhat excessive.

Varieties, Colour, and Markings. Only one variety (Black-and-White, mottled) is permissible, but Blues have been seen at times, while in America the White is favoured. The crest, beard, and muffling are black and white, evenly distributed, although they are sometimes lighter than the remainder of the plumage, which is glossy green-black regularly mottled with pure white, the mottles being sharply defined and free from any black stripes. The wing flights and secondaries, and the sickles and tail feathers of the male bird, are irregularly edged with white. It often happens that young cocks are almost black throughout, the white mottles being very small; but birds with more white than black in their plumage are sometimes seen. The ideal is to have both the black and the white level, and the mottles evenly distributed. The beak is horn coloured; the eyes are red, the comb, face and wattles bright red, the ear-lobes white or pink tinged, and the legs and feet white mottled with lead-blue or black.

Utility Properties. In its prime the Houdan was eminently suited for table purposes since it was fleshy and plump, there was a good proportion of breast meat, the bones were small, and the flesh and skin were white, while the birds could stand fattening in coops. I am afraid, however, that the breed is little used for such a purpose nowadays in England, and where these birds are kept, it is for egg production rather than for table chickens. The eggs are white. Nevertheless, comparatively few Houdans are seen over here now, and they are generally of a much lighter build than the bird which was known in the old days as the French Dorking.

Standard Requirements. For show purposes 35 per cent is allowed for head points (comb, crest, and muffling), and 15 per cent for colour and marking. Then follow size 20 per cent, and type, legs (feet), and condition, each 10 per cent. In my opinion, stressing head points to such an extent as exhibitors in this country do has not encouraged the breed's one-time very useful properties. It has, in fact, had the reverse effect, and the massive crest and muffling seen on our show Houdans, although admittedly beautiful, has been obtained only by unduly confining the birds, and thus weakening their vitality. Show specimens, to stand anything of a chance, must have well-preserved crests; and this is not possible if the fowls are allowed to range freely at all seasons. And yet, in my early days, the Houdan—with much less crest—was a good forager and a reliable layer.

The Indian Game (Sitter)

The Indian Game has a very near relative, the Jubilee Indian Game, now known to some as the Jubilee Game; hence they will be considered as one breed—which, indeed, they are, although classified separately. The Indian Game is very popular in the west of England, but perhaps it is scarcely so well known to the general poultry-keeper as to be numbered among the popular breeds. The origin of the Indian Game—or Cornish fowl, as the breed is generally known in America—cannot be traced with any satisfactory results; almost all writers appear to be silent on the point. Nor can the most prominent breeders be induced to venture an assertion respecting it. It is generally supposed to have been the outcome of the Aseel (a Game fowl of India) grafted more or less on to Malay stock. Certainly, our original Indian Game somewhat resembled the Malay fowl; and, judging from its early appearance, there is scarcely any doubt it was closely allied to the Malay family.

However, be its origin what it may, the breed so popular in the West is as pure to-day as any, because there is not another which breeds more true to its points. Moreover, as we now see it, the Indian Game is unquestionably a Cornish fowl, or, at any rate, a pure product of the south-western counties of England. Neither is it a true Game breed, since, while its plumage is hard like that of the Game cock, its very build prevents its being more of a fighter than the usual robust fowl.

General Characteristics. No matter what the variety, whether just "the" or Jubilee, the general characteristics are the same. It is a heavy breed, a sitter, and a table fowl rather than a general-purpose one. Its general appearance and carriage are thus

described in the Indian Game Club Standard: "Powerful and broad, very active in pen, sprightly and vigorous; carriage upright, commanding and courageous, the back sloping downwards towards the tail, flesh firm in handling, plumage short, hard and close."

The general shape of the cock's body is thick and compact and tapering slightly to his tail, the shoulder-butts showing prominently. The back is short and

FIG. 162. AN INDIAN GAME HEN

rather flat but not hollow, and the breast wide and well rounded, while the sides are round rather than flat. His wings are short and muscular, somewhat high in front, carried closely to the body, well rounded, and tightly tucked at their ends. His tail is of medium length, slightly drooped and furnished with short and narrow secondary sickles and coverts, which are close and hard.

The cock's legs are strong and thick, the thighs round and stout, the shank bones of medium length and well apart, and the feet (four-toed) strong and spreading, the fourth toe (the back one) being low and nearly flat on the floor. The Club insists that "The length of shank must be sufficient to give the bird a gamey appearance, but in no case should it be as long as in the Malay, or in any way stilty." In other words, the cock must have sufficient length of leg to enable him to be active, both on the run and in the breeding pen, so as to avoid, on the one hand, a shortness which would give him a waddling gait, and, on the other, a length that would render him unable to stand steadily.

The general appearance of the cock's head is broad, thick and rather long, and with very slightly beetling brows, but neither keen like the Game cock's nor as thick and heavy browed as the Malay, which brows give this latter breed its sullen and cruel expression. His beak is short and well curved, stout at the setting on, denoting power. The eyes are full and bold, despite the slight beetle brows, and the ear-lobes and wattles are small. The comb (of the undubbed cock) is of the pea or triple type, small, and closely set on his head, while his throat is almost bare, and his whole face smooth and of fine texture. The neck is of medium length and furnished with short hackle feathers, which just cover the base of his neck.

Most of these points apply to the hen, allowance, of course, being made for the difference of the sexes. In fact, the only practical difference is that the hen's tail is not carried as low as the cock's, although not high. In both sexes, however, the carriage is bold and powerful, the back sloping downwards to the tail, the shoulders up, and the legs well apart. The plumage is short, hard, and close, and the handling firm and muscular. The weights of adult Indian Game are not less than 8 lb. for the cock, and 6 lb. for the hen.

Varieties, Colour, and Markings. Here we may be said to be "up against it." According to one section of the Poultry Fancy, there is only one variety of Indian Game—"the" Indian Game, practically a very dark partridge. But there are others. The Jubilee is one such, known in America as the White-Laced Red Cornish—as true an Indian Game as any bird bearing that name, and originated towards the end of last century by a Gloucestershire breeder.

The Black and the White are other varieties. The Black was bred somewhat extensively about sixty years back in the south-west of England, particularly, I believe, in Devon and Cornwall. Indeed, it is said that the present Indian Game owes much to the Black for its increased size and the dense colour of the cocks. Very possibly it was the result of running Indian Game and Black Minorcas on the same range, a common enough thing in the early days in Cornwall and Devonshire, where the farmers kept the former breed for the production of table fowls, and Minorcas as layers. The White was undoubtedly a "sport." It was never cultivated in England to any extent, although specimens of it have been occasionally met with, but not within recent years.

As regards colour of plumage, that of the oldest variety may roughly be described as very dark partridge. Black predominates in the cock's feathering,

a rich satiny black—or "a rich green glossy black sheen or lustre," to quote the Standard—but in certain parts this is relieved by bay or chestnut. For instance, his hackles are slightly broken with it at their base, although many breeders, fanciers, and judges prefer dense black hackles to those showing much red. His shoulders and wing bows are intermingled with rich bay or chestnut in the centre of the feather or shaft. And when his wings are closed there is a triangular patch of it, which is formed by the secondary feathers having a short narrow fringe of bay or chestnut on their outer webs.

The hen's ground colour may be chestnut-brown, nut-brown, or mahogany-brown, and this is laced with beetle-green, with the exception of her head and neck-hackle, which are black. The lacings, generally double, vary in size according to the different parts of the body, but they follow the form of the feather. The black in them should be "metallic green, glossy black or beetle-green," and looking as if embossed or raised. The fleshy parts of the head of both sexes are brilliant red. The beak may be horn or yellow, or horn striped with yellow, the eyes of any colour between pale yellow and pale red, and the leg-shanks are rich yellow or orange.

The Jubilee Indian Game cock is white, touched here and there—"slightly broken"—with bay or chestnut, while the ground colour of the hen is similar to the hen described above, but the lacing (single in this case) is white.

Utility Properties. For utility purposes the Indian Game figures chiefly for table qualities. The chickens are remarkably hardy and thrive with the minimum of attention. The pullets are not prolific producers, although they lay steadily throughout winter when on range and produce dark tinted eggs. It is from the gastronomical point that the breed must be viewed. The birds have the depth and wealth of breast meat which endears them to those who understand what poultry meat really is, for of a truth they are supreme table fowls. Well-fed Indian Game cockerels are the birds for those who want to carve something worth eating, to cut and come again, and to put fowl on as the chief course.

For crossing, too, there is no better bird than this for stamping breast meat on the progeny. An Indian Game cockerel at six to eight months of age can be mated with any of the general-purpose fowls, and several non-sitters, too, for improving table qualities in the chickens. The male bird is, of course, a "gold" for sex linkage, and for this purpose he is an excellent mate for Light Sussex and White Wyandotte hens.

Standard Requirements. Type and colour are the most important points of the Indian Game, and they account for 53 per cent. Head points rank next with 17 per cent, and they are sectioned as skull, eyes and brows 3 per cent each, beak, wattles, ear-lobes, and comb 2 per cent each; but it is customary to dub the cock, hence the comb, ear-lobes, and wattles are removed, leaving the skull and lower jaws smooth and free from ridges. The carriage of the bird is allowed 12 per cent, size 10 per cent, and condition 8 per cent. Lack of size, however, is a defect; and in this case size means weight, because tall and long-legged Indian Game are not desirable for show purposes. Of recent years there has been a tendency in some quarters to breed birds much over standard weight and with legs too wide apart. This is detrimental, because it robs them of the desired activity and upright carriage, and causes them to waddle rather than to move gracefully.

The Jersey Giant (Sitter)

It is generally supposed that the Jersey Giant originated in New Jersey, U.S.A., over fifty years ago, and that it was evolved specially for the production of table fowls for the Philadelphia markets. Hence, it is considered as an American breed. Those who claim New Jersey as its home tell us that the object of bringing it out was to produce a heavy type of bird, and that to secure it the Black Java, the Dark Brahma, and the Croad Langshan were scientifically blended. On this point, nevertheless, there is some doubt, because, in 1927, Mr. Christopher J. Turle —who acted as Secretary to the Jersey Black Giant Club for some time—put it on record that the breed actually originated in Spain.

"My informant," he wrote, "an old sea captain and Minorca fancier, actually saw Jersey Black Giants belonging to a coal merchant in Gibraltar. That was in 1885–7. The coal merchant purchased the birds from Algeciras, where, no doubt, there are many to-day still basking in the semi-tropical sunshine. The captain has for years won prizes at the 'classics,' and the story is very true indeed."

In Mr. Turle's opinion, its Spanish origin accounts for two characteristics which are predominant in the breed, viz. its great stamina (through the change from Spain to New Jersey) and the almost non-broody factor, due to Andalusian ancestry. He admits, though, that after many years' selective breeding in New Jersey it was considerably improved. Now, however preposterous this European ancestry may appear to some readers, there may be something in it, because that very popular breed of Italian origin, the Leghorn, reached England from America, while the Brahma (of Eastern Asia) was popularized in the U.S.A. before showing up here.

The Black variety came to the front in America as

a table breed long before it was bred in our country, because not until 1921 did it enter England, although a club for it was formed in 1922, and its standard recognized by our Poultry Club in 1924. When the Giant was first acknowledged as a standard breed in America, white undercolour was specified. But one English breeder, who had his first imported Blacks selected from farms in New Jersey about 1921 or 1922,

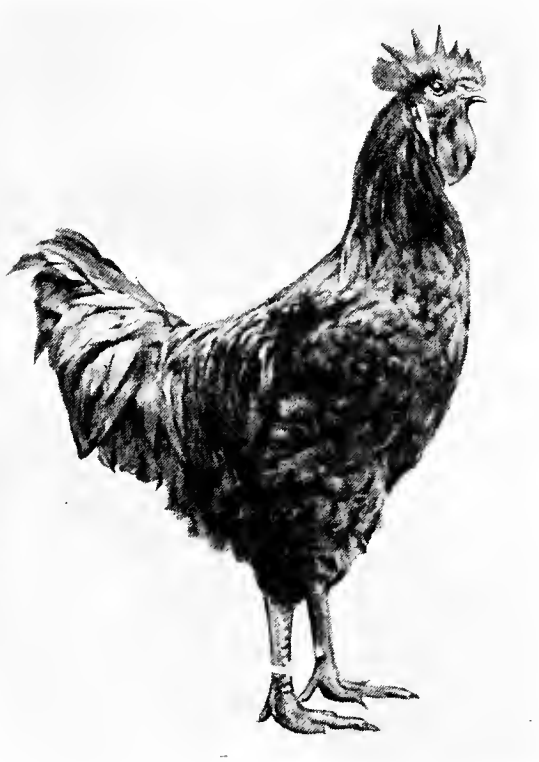


FIG. 163. A BLACK JERSEY GIANT COCK

insisted on, and obtained, birds with slate undercolour. At that time American breeders decided to continue with white undercolour, and they crossed Plymouth Rocks and other breeds with the Giants. Hence, they naturally produced fowls with surface white, and a few white sports.

It is said that none of these white sports was kept and bred from; but it is not denied that they existed. Consequently, what more natural than a White Giant? One breeder, who was keen on Blacks, produced a beautiful specimen of the White—pure white, of heavy weight, and having dark eyes and light willow-coloured legs—by mating a Black Giant cock with a White Wyandotte hen. He, therefore, declared that the White is not a true albino. This may be so; but it does not prove to me that the present White Giant is not as pure bred as the Black. About 1923 to 1924 a Blue Giant was launched in the U.S.A., although it never became popular, which is so often the fate of blue varieties, no matter what their breed.

General Characteristics. Classed as a general-purpose breed and a sitter, the Giant is undoubtedly better for table than for laying, but in this latter respect it is almost a non-broody breed. Hence, its egg capacity should be good—some years ago it stood well at a Laying Test. The body is long, wide, deep, and compact; the back broad and nearly horizontal, with a short sweep to the tail, and the breast deep and full, and carried well forward. The wings are tucked up closely, at the same angle as the body. The tail is rather large and well spread, the cock's being set on at an angle of 45 degrees and the hen's carried at an angle of 30 degrees.

In both sexes the legs are of medium length and well apart, the thighs large and strong, and the shanks cleanly scaled, the toes (four on each foot) being straight and well spread. The comb is single—six-pointed is the ideal—and upright, the bottom of the blade following the shape of the neck. The eyes are full and prominent, the wattles of medium size, and the ear-lobes rather large. The face is smooth, and the neck moderately long. The carriage is alert and well balanced. Standard weights are: Cock, 13 lb.; cockerel, 11 lb.; hen, 10 lb.; and pullet, 8 lb., weights which have been exceeded.

Varieties and Colour. As already mentioned, there were three varieties of Jersey Giants, but only the Black and the White are seen to-day in this country; and all that need be said of the plumage is that the former should be lustrous green-black on the surface, with slate or light grey undercolour, and the White just white, without smoke, yellow, or any tint, and almost white skin. The comb, face, wattles, and ear-lobes, in both varieties of the Giant, are red. In the Black, the beak is black, shading to yellow towards its tip, while the eyes are dark brown or hazel; the shanks and feet are black (with a tendency towards willow in adults), and the soles yellow. The White's beak is willow, some yellow being permissible at present. The eyes may be dark brown to black but the shanks and feet should be willow (a dark green-yellow), and the soles yellow.

Utility Properties. The breed can be confidently recommended for general purposes. So far no attempt has been made to develop it into a super layer, which is decidedly wise, because, first and foremost, it is a table fowl. In this respect, it scarcely equals the Sussex, merely because the Giant does not develop as rapidly, nor can it be coop-fattened. Nevertheless, it does stand rough rearing, since the chicks "hatch strong" under normal conditions, and give the rearer little, if any, trouble. They grow steadily, which pleases me, because, so large is their frame, if they

grew rapidly they would soon outgrow their strength, and thus become a nuisance.

Stamina they possess, without a doubt, because they are eminently suitable for free range, and would probably get soft in confinement. The Jersey Giant is what may be termed a farmer's fowl, fit in every way to look after itself, and particularly well suited for exposed places. Winter-hatched pullets can be depended on for autumn laying; but while, taken generally, the output falls behind that of the popular breeds, the numbers and size of the eggs are in every way satisfactory. On the whole, the eggs are first grade for market requirements, and tinted, which makes them readily saleable. It is as table fowls, however, that Giants are becoming popular, because cockerels can be picked off the run and killed for market without finishing in a coop. They are plump to a nicety.

Standard Requirements. According to the scale of points in connexion with the standard adopted by the specialist club which looks after the Jersey Giant, shape and carriage are the most important consideration, and are allotted 25 per cent. General colour follows with 20 per cent, then comes "quality" 15 per cent, and finally head points, size (and symmetry), condition, and legs (and feet) 10 per cent each. Shape, i.e. type, which includes symmetry, is certainly important; but in such a breed as the Giant—in which more than 2 lb. below the standard weight is a serious defect—size should rank level with it, hence the points given for "quality" should be added to size, and it would be in keeping with the breed if shape, colour, and size each got 20 per cent, and the other four sections 10 per cent each.

The Lakenfelder (Non-sitter)

Writing over thirty years ago I said that the Lakenfelder was one of the very latest fowls which poultry fanciers and poultry-keepers generally in this country had taken in hand, because it was in 1902 that the breed was first boomed in England; but so little is thought of it in our country that I question if many specimens of the Lakenfelder are to be found here to-day. I should scarcely have mentioned it but for the fact that there is some talk of reviving the breed, for which a full standard appears in the Poultry Club's publication. Whether this fowl came originally from Jerusalem, as some authorities assert, or whether it is of European extraction—some claim it as Dutch, others as Belgian, and yet others as German—matters little, because it never was kept on this side of the English Channel as a producer but merely for exhibition. It was supposed to be a great layer; but, like the Campine and the Hamburgh—which breeds it closely resembles in general characteristics—it lays small eggs, and white eggs also.

General Characteristics. Those already mentioned in connexion with the Campine will be found to answer for the Lakenfelder. The comb is single and carried in an upright position in both sexes. The birds are very active, and being of light weights—cocks scale $4\frac{1}{2}$ lb. to 5 lb. and hens 4 lb.—are great flyers.

Variety and Colour. There is only one variety, and the colour is the same in both sexes. The neck-hackle (and, in the cock, the saddle-hackle) and tail are solid black of a velvet appearance attainable by the brilliant gloss of its plumage, while the body, thighs, and wings are pure white, free from spots, streaks, stripes, or ticks. The beak is dark horn colour; the comb, face, and wattles are bright red, the ear-lobes white, the eyes red or bright chestnut, and the legs slate blue.

Utility Properties. The breed cannot be spoken of very highly, so far as it has been possible to judge of it in England. The formation of its body does not favour flesh production, and as a table fowl the Lakenfelder is naturally unsuitable. I am told that in Germany the breed was cultivated with a view to increased egg production, and in that country it was said to have held an important position as a layer. But specimens which have been kept in England have been selected for their show points rather than for utility, because the eggs produced by them were not only somewhat small but the hens were not great layers, and in both points they are excelled by the Campine. The birds are of an active disposition, good foragers, and hardy enough. The chickens are quick growers.

Standard Requirements. The great point to aim for in exhibition specimens, and the one, too, which counts most in the Standard is colour, with 45 per cent. The neck and tail must be black; and for this reason the undercolour should be grey rather than white, since the more inclination there is to white, the greater tendency there is to expel black from the plumage. And, in breeding, it is advisable to permit the grey undercolour slightly to penetrate to the surface plumage—provided there is not too much black showing on the back—rather than to allow the appearance of white in the tail or the neck-hackle. Some breeders consider white edging on the cock's sickles as typical, but it counteracts the proper breeding tendency, which should aim at a black tail without any white. Following colour, the next important point is size, 20 per cent; then 10 per cent each for head, type and condition, and 5 per cent for legs and feet.

The Langshan (Sitter)

Because the present-day type of Langshan, which was adopted by the old-established Langshan Society, differs from what is looked upon as the original type—the birds imported in 1872, and subsequently termed

the Croad—it has been suggested that the more recent breed (the Modern Langshan) is no longer pure, but has been mongrelized by the introduction of foreign blood; and such breeds as Game, Spanish, Hamburghs, Houdans, have been mentioned as having been crossed with the original. It may be that some strains have been crossed, but there is no direct proof of this; and it is a mistake to imagine that this breed is no longer pure. During the many years I have been connected with the Poultry Industry, and particularly with that section of it which deals with standard breeding, I have seen several breeds improved or altered to suit the requirements of fanciers; and these changes have been brought about, in most cases, purely and simply by carefully breeding and selecting the original stock for the end in view. Such is what has happened in connexion with the Langshan of what most of us term the modern type. The Langshan of 1872 showed a marked similarity to the Black Cochin of that date; and this will be admitted by every unbiased observer who cares to compare the early illustrations. Although no one who thoroughly knew these two breeds—the Cochin and the Croad Langshan—could confound them, it was left to members of the Langshan Society, by breeding to a more refined and elegant model, to show exhibitors at a glance the distinctness of race from the Cochin.

This formation, by English fanciers, of a different type was at first vigorously opposed by the introducers of the Langshan. It was admitted that the early importations were of various stamps—some short and loose-feathered like the Cochin, some tall and close-plumaged, and some even with clean shanks. In the opinion of many fanciers, a great mistake was made in not, from the beginning, breeding the Langshan as far away as possible from the Cochin, by selecting the clean-legged specimens and breeding from them only. The Poultry Fancy would have welcomed with open arms a fowl as large as the Cochin, with the symmetry of the Minorca, and the economical qualities of both. Instead of this, birds of all the varying types—which any breed will show before fanciers take it in hand and select to one ideal—were exhibited until judges, fanciers, and others were confounded. After years of strenuous opposition, however, the Langshan is exhibited showing a distinct and uniform type of refined elegance, totally removed from the other specimens which were originally exhibited. Because this has resulted, breeders of the tall and close-feathered stamp have been accused of crossing it with the Modern Game to obtain the desired effect, while all they have done was simply to select those birds which came nearest to their ideal; and by constantly selecting the same sort they have produced the modern type of Langshan.

General Characteristics. The Langshan belongs to the Asiatic group, but the modern type is undoubtedly English. The cock's body is long and broad but by no means deep; his breast is round and full—not cut away flat in front of the thighs, which leaves a hollow and tucked-up appearance—while his back is long and flat and broad at the shoulders, neither hollow in the centre nor what is termed "roach" backed. The wings are large, and they are carried rather low and closely, though not clipped in; his tail is long and fine, not spread out like a fan, but with the feathers closely carried though not "whipped" like the tail of a Modern Game cock, and it is carried between the perpendicular and horizontal. The head is fine and free from coarseness, and the beak fairly long and slightly curved. The face is of fine texture, free from hairs and creases, and the comb rather small for the size of the bird, single, upright, firmly set, serrated with five or six spikes, and of fine granular texture. The eyes are large and intelligent, while the ear-lobes and wattles are of medium length, the former inclined to fold and the latter neatly rounded. The whole head has an alert appearance. The cock's neck is long and fitted with a full flowing hackle, tapering from the head and increasing in fullness until it falls over his back.

His thighs are of medium length, wide apart, and encased in closely fitting feathers, especially around the hocks, while his shanks are long, not thick and coarse but sufficiently strong to support his body; and his toes (four) are long, straight, and well spread. An even fringe of close and short feathers runs down the outside of each shank to the end of the outer toe; and this toe alone should be slightly feathered, the others being clear. Thick and coarse quills around the feet are not desirable; neither should the feathers project from the shank but lie closely without any breaks or patches, the last feather at the bottom lying in a line over the outer toe. The length of the leg of the Langshan is more apparent than real, and is simply caused by the tightness of the feathering around the thighs, and by the absence of excessive fluff. A cockerel will appear taller than a fully-matured cock, because depth and fullness of body are not developed in young birds. The tallness of the cockerels has, indeed, been referred to as making the birds appear like ostriches or storks; but until they are matured they look much more leggy than is actually the case, and when they reach their second and third years they are of a normal shape.

Compared with the male bird the female has a somewhat longer back, while her tail is close, terminates in a fine point, and is carried at an angle of 45 degrees from the horizontal. There is in the hen an entire absence of cushion and fluff, giving her a

long, sleek, elegant appearance. No one has ever been heard to remark that the pullets are too tall; and, when bred from the same pen as the apparently tall cockerels, they never show legginess. The general appearance of the Modern Langshan is graceful, upright, and alert, strong on its legs, and having the bearing of an active fowl; the plumage is close and smooth. The standard weights are: for the cock 10 lb., cockerel and hen 8 lb., and pullet 6 lb.

Varieties, Colour, and Markings. Three varieties are standardized by the Poultry Club, and they are Black, Blue, and White. The Black's plumage is covered with metallic beetle-green sheen, lustrous and glossy without any purple or blue tinge, free of the slightest sign of white or red; and this goes right through from the head to the tip of the tail. The secondary wing features of the cock are generally the most brilliant, then his sickles, hackles, and back; his breast is hardly as bright, and his thighs still less so, but every feather is green-black, simply varying slightly in lustre according to its position on the body. I question if any black plumaged fowl possesses such perfect green sheen over the whole of its body as does the Modern Langshan. The plumage of the White variety is pure white with a brilliant silver lustre, while the Blue, in body colour and markings, is similar to the Andalusian.

In the White, the beak is white with a delicate pink shade near the lower edges, the legs and feet are light grey or slate showing pink between the scales and on the skin between the toes, and having white toe-nails and pink-white under the feet; but the head points are similar to those points of the Black. In the Black and the Blue, the beak is dark horn to black, the eyes are dark brown to black—the darker the better—the comb, face, ear-lobes and wattles brilliant red, and the legs and feet dark grey with black scales in front and down the toes. They show pink between the scales (especially down the outer sides of the shanks) and on the skin between the toes, the nails being white, and the sole pink-white. The skin of the body and the thighs is white and transparent.

Utility Properties. The breed is a general-purpose one. The females are sitters and fair layers of dark tinted to rich brown eggs, while the cockerels make first-rate table fowls for home use, the meat being white and plentiful when the birds have been well fed. It has often been stated that there is only one objection to the Langshan as a table fowl, namely, that the feathered leg-shanks do not improve the bird's appearance when it is dressed and served on the table. This, however, is a very minor defect and one which can be very easily remedied, since it is possible to cook and serve a bird minus its shanks. In addition to these two utility points, the breed is quite hardy and the chickens are easy to rear, despite their long legs. They can be kept on any soil fit for fowls, while they are quite contented and thrive in the ordinary small quarters of a back garden. Some of the very best Modern Langshans I have ever judged, strong-limbed and active birds, and good layers also, have been reared in a London suburban garden.

Standard Requirements. The chief points in show specimens are type and colour. The former, combined with carriage, is allowed 35 per cent, while colour plumage is given 20 per cent. Head points rank next with 15 per cent, then legs (and feet), size and condition get 10 per cent each. Heavy birds are desired, but coarseness of bone and clumsiness of gait are very objectionable. Any yellowness of the skin or under the feet is a serious defect, but lack of feathering on the shanks is equally bad, and so, too, in my opinion, are heavily feathered feet, and particularly feathers growing on the middle toes.

The Leghorn (Non-sitter)

Although the earliest English importations of Leghorns, in the late sixties, were from the United States of America, the breed originated in Italy. It belongs to the Mediterranean group, but it differs from the Spanish races in two or three points. Records show that the first fowls known as Leghorns in America were imported from the city of Leghorn (in Italy) and landed at Boston (Mass.) in 1853. And it would appear that one consignment consisted of four White hens and a cock, and one Blue hen—the latter being what is now known as the Cuckoo—while the other lot was a trio of Browns, yearlings, scaling $9\frac{3}{4}$ lb. These latter birds were real Browns, not Black-Reds like the present Browns. The male's breast was dark brown spotted with light brown, while his hackle was light brown striped with black. The hens were like the poorest specimens seen occasionally now—not as distinctly pencilled, and decidedly "foxy." Some of the original birds had white lobes and others red. The Browns were larger-bodied but shorter-legged than the Whites, while the colour of the beak and legs of those first Whites was the same as that of their plumage.

The whole of the other varieties are of much more recent introduction, and many of us remember when they first came into being. The Pile was brought out in 1886 by a well-known fancier, after carefully breeding the Brown with the White for about six years. That same fancier was also instrumental in perfecting the Cuckoo, about 1888, from a pen he purchased direct from Italy in 1885, while the introduction of the Duckwing in 1888 owed much to his careful breeding. The Buff was bred for some time in Denmark and Germany, and was first brought to

England from the former country about 1888. The Blue is quite a recent innovation, while the Exchequer was produced by a Scottish breeder. Most of the other colours, however, probably the whole of them, were obtained in Italy or thereabout, while the rose-combed sub-varieties—the original Leghorn was a single-combed fowl—were started in America.

General Characteristics. The breed belongs to the non-sitting class, and when bred to standard it has

FIG. 164. A BUFF LEGHORN COCKEREL

no superior. The Leghorn's body is that of the ideal layer proclaimed by the handler—wide in front and at the base of the tail, and deep through from cushion to stern. The breast is full and prominent, and the back of medium length, while the wings are large and tightly carried against the sides, but not so high as almost to obliterate the outline of the back. The cock's tail is fully sickled, and carried at an angle of 40 degrees to 45 degrees from the line of his back, while the hen's is carried fairly closely (but not "whipped," as some exhibitors appear to imagine) and hardly as high, although a drooping tail must not be permitted in either sex.

The head is fine, and the expression intelligent and alert, while the fleshy parts are smooth and free from creases, but the comb is of a fine granular character. The wattles are fairly long, and the ear-lobes inclined to be pendent rather than round. The single comb is of medium size, neither coarse nor "beefy," erect in the cock, and falling gracefully over either side of the hen's face without interfering with her sight. The rose comb is also of medium size, firm on the skull, the top covered with small coral-like points, and the leader extending straight out behind. The neck is long and the body sloping slightly towards the tail. The legs are of medium length but not "stilty," the shanks fine and round, free from feathers, and the toes (four) long, straight and well spread.

The whole bearing of the Leghorn is sprightly and alert, with something of the fighter rather than nervousness in its carriage—bold and upright. The plumage is close and the flesh firm in the hand. The standard weights are: Cocks not less than 6 lb., and hens not under 5 lb., excellent weights for layers.

Varieties, Colour, and Markings. The Leghorn is a vast family and consists of seventeen varieties "doubled," i.e. in each of them the single comb as well as the rose comb is permissible. The list includes Black, Blue, Brown, Buff, Columbian, Cuckoo, Golden Duckwing, Silver Duckwing, Exchequer, Furness, Black-Mottled, Red-Mottled, Partridge, Pile, Red, Silver-Pencilled, and White; but not all of them have been admitted to the Poultry Club Standard. Few rose-combed specimens, however, are seen nowadays—although one may perhaps except the Black—while the Black, the Exchequer, the Brown, and the White are the only varieties bred to any extent, little being heard of the others.

The plumage of the "self-coloured" varieties is as follows: the Black, rich green-black or blue-black, the former preferred, i.e. black with a dark green sheen; the Blue, an even shade of blue, a dark tint being permissible in the hackles of the cock; the Buff, any shade of buff from lemon to dark, avoiding washiness or a red tinge, the colour being uniform but allowing for greater lustre on the hackle feathers and the wing bows of the cock; the White, pure white free from straw tinge.

The Brown is almost similar in colouring to the Black-Red Game. The cock is chiefly black, and black to the skin, white in tail or light undercolour being avoided. His neck-hackle is rich orange-red striped with black, and crimson-red in front. His back, shoulders, and wing bows are deep crimson-red or maroon; wing-coverts steel-blue with green reflections forming a broad bar across; and saddle rich orange-red with or without a few black stripes. The colouring of the female is more subdued, but with a charm of its own. She has a rich golden yellow neck-hackle broadly striped with black, salmon-red breast running into maroon at the top and ash-grey at the thighs, and her body colour is rich brown (no red tinge or "foxiness"), very finely pencilled with black.

The colour and markings of the Columbian are like those of the Light Brahma, while the Cuckoo and the Partridge are similar to the Cochin of those varieties.

The Furness is like the Old English Game, the Pile similar to the Modern Game, and the Silver-Pencilled identical with the Dark Brahma. The Golden Duckwing cock is practically light orange where the Brown cock is maroon, while in the Silver Duckwing cock the colour is silver-white with black; the Golden hen is similar to the Brown, although her body colour is dark slate-grey, while the Silver hen is of a lighter or softer tint all through. The Exchequer is black and white evenly distributed, with some white allowed in the undercolour, the white of the surface colour being in the form of a large blob as distinct from V-shaped marking. It might well be mistaken by the novice for an Ancona; but it is mottled with bolder white markings than the Ancona, showing more white all over its body, and with a laced tail in the male. The Mottled are marked like the Houdan, the variety denoting the ground colour. The Red is "rich brilliant red" but almost a chocolate. No matter what the variety of Leghorn, the beak, legs, and feet are yellow, the eyes, comb, face, and wattles red, and the ear-lobes white.

Utility Properties. Like the Ancona, the Leghorn cannot be classed as a table fowl; but it does excel at egg production. It is one of the greatest layers of the day; in fact, I doubt if there is a breed to surpass it for number of eggs. It was so half a century ago, long before the advent of laying competitions; and solely on account of its prolificacy it was the first breed selected by the progressive poultry-keeper for pedigree-breeding for laying qualities. During my long connexion with all that appertains to the keeping of cocks and hens, I have seen more than one breed bloom and droop, aye, and perish. But, while attempts have been made to extinguish the Leghorn, its end is not yet.

Not unlike most other popular breeds of to-day, it has had its ups and downs. Size was a point which seemed to worry some breeders. At one time it was quite common to see at exhibitions birds masquerading as Leghorns which were far too big, coarse, and ungainly. The fancier, however, has not been the only one who attempted to spoil the breed. Size, but in the opposite direction, suffered at the hands of the utility breeder; and not a few laying strains, of Whites particularly, were little better than those Leghorns of the early 'fifties, which scaled 9¾ lb. the trio. The breed is more a racehorse than a shire. Still, one must not expect stamina, the power to produce strong stock, and marketable eggs in plenty, from the undersized and sickly looking specimens which were sometimes met with among utility strains.

The Leghorn is a layer. It is exceedingly active and hardy, a good forager at liberty, yet contented in a small run, while the chickens are very precocious, easy to rear, and furnish at an early age. Being so precocious, however, it is not advisable to hatch Leghorn pullets—and particularly laying strain Whites—before April, if the intention is to rear them for autumn and winter eggs. Allow them to develop naturally, taking their time to furnish. They must be separated from the cockerels at the earliest possible moment; and in their feeding avoid anything of an overstimulating kind. In this way they will be sufficiently

FIG. 165. A WHITE LEGHORN HEN

advanced to lay marketable eggs soon after they start.

Some people object to Leghorns because in their second season the hens are not prolific winter layers. As a rule, this may be said to be the case; but it is beneficial rather than detrimental. With good management the pullets can be kept steadily at production for twelve months or more; those which are hatched in spring can be brought into lay in September, and be still laying during the following September, with few, if any, rests. As a rule, such birds drop into a quick moult, losing their old plumage practically all at once. They may furnish up again before the end of the year, but seldom do they recommence laying then, although it may be possible to force-feed them into it. However, I never attempt to do so, because their long rest, with suitable management, enables them thoroughly to recuperate and to have sufficient energy to make excellent breeders. From such hens one can breed strong pullets.

For Sex Linkage. It must be mentioned that both the Black and the Brown male birds are ideal for sex linkage, the former to be mated with Barred Rocks and the latter with Light Sussex or Columbian Wyandotte hens. Here, then, is an outlet for surplus cockerels. The White, too, on the male side has been tried with "golden" females, Rhode Island Red hens, for sex linkage. This is not an orthodox gold-silver link; but such mating, in the main, produces buff cockerels and white pullets. Taken all round, therefore, the Leghorn is a first-class breed to cultivate for egg production, either in the back garden or on the farm. It lays white-shelled eggs, admittedly, but in splendid numbers; and, although the brown egg is favoured in this country, the pure white egg produced by the Leghorn, generally with a good texture of shell and of standard weight, is always readily saleable at remunerative prices.

Standard Requirements. As regards the scale of points, this differs almost according to the variety; and thus there are seven mentioned in the Poultry Club Standard. In the Black, the Brown, and the Buff, head points are the most important sections, then follow colour and type. In the Blue, colour ranks first, then type and head points; in the Cuckoo, Duckwing, Mottled, and Pile, type takes preference to colour, and then follows head; in the Exchequer "indications of productiveness" get 30 per cent, with type and colour 20 per cent each, while in the White, type ranks as 25 per cent and head and colour as 20 per cent each. In no variety are size and condition of much account, the former generally 15 per cent and the latter 10 per cent. In my opinion, type is the great point for which to breed, then colour and size; and if breeders and judges would study true Leghorn characteristics first of all, and not encourage exaggerations of head points, the breed would be very considerably benefited. Too much has been made of the comb, and of ear-lobes "of pure opaque white (resembling white kid)." Admittedly, the cock's single comb should be erect and without any twist or droop, while the hen's comb, to match, should fall gracefully over either side of her face; but the former should not be "beefy," almost as big as the palm of one's hand, neither should the hen's comb be so large as to prevent her the use of one eye.

The Malay (Sitter)

The Malay fowl belongs to the races of the East, since it is a native of the Malay Peninsula, the most southern point of Asia. Just when the breed was first known in England it is impossible to ascertain; but there is ample evidence that fowls of this type were to be found in the extreme south-western counties of our country in the early part of last century, and some years prior to what is known as the Cochin mania. Writing of the breed in the "Poultry Book" of 1853, the authors remarked, "The western districts of Cornwall, especially around Falmouth, abounded some years since with fowls of good Malay blood. Many of them had been landed there from the East Indiamen that were accustomed to make that town their port of call on entering the English Channel."

FIG. 166. A RED MALAY COCK

In its early days the breed was known to some authorities as the Kulm cock; but that both of them were one and the same is almost certain, as the following quotation from the "Zoological Society Proceedings" for 1832 will show—

> Colonel Sykes imported two cocks and a hen into England in the June of 1831 . . one of the cocks measured, when standing erect, 26 in. to the crown of his head; his length, from the tip of his beak to the end of his tail, was 23 in. The hen was one-third smaller than the cocks. In comb, colours, and other points they resemble the Malay fowl.

Practically speaking, the Malay is now almost purely a fancy breed, since, while it has some utility points, it is questionable if it is kept in any great numbers except for the show pen. There are many people

who consider the breed extremely ugly; but that, of course, is a matter of opinion.

General Characteristics. It must be admitted that the characteristics of the Malay are very marked and peculiar, and the bird is not altogether a pleasant-looking one, although it may well be described as a "beautiful ugly." The body is broad-fronted and tapering, the breast deep and full, with the skin of the turn of the breast-bone showing through the feathering. The back is long, and it slopes downwards with a convex outline; and the saddle is narrow, drooping, and scantily furnished. The shoulders are high and prominent, and bare at their points, the wings are large and strong, and carried closely to the sides, i.e. well tucked. The tail is of moderate length, drooping but not whipped closely like that of the Modern Game, the sickles being narrow and only slightly curved.

The cock's head is broad and fairly long, with very heavy overhanging eyebrows (beetle brows), which, together with the short and curved beak—much more so than in any other breed of fowl—give that cruel and sinister expression to the bird which is so well known. His face is bare (or nearly so) of feathers, giving it a skinny and red appearance, while his comb, shaped like a half walnut, is small and set well forward, and free from irregularities—the profile of the skull and beak approaches in shape a section of a circle. The eyes are deep-set, and the wattles and ear-lobes small. His throat is free of feathers, the bare skin being seen two to three inches down his neck. The neck is long, scantily feathered with short and hard hackle, except at the skull, and with a slight curve. The outline of his neck-hackle, back, and tail (upper feathers) should form a succession of curves at nearly equal angles. His legs are long and massive, the thighs being muscular and scantily feathered, leaving the hocks well exposed, and the shanks flat at the top and gradually rounding to the spur, which has a downward curve, while the toes (four) are long, straight, and powerful, the back one being on the ground and straight out.

The hen is similar in all respects, except that her tail is rather short and square, neither fanned nor whipped, carried slightly above the horizontal, and well "played" as if flexible at the joint. Malays are tall and fierce-looking—although their fierceness ends with their expression—standing high in front and drooping at stern, straight out at the hock, and having a hard, clean, cut-up appearance from behind. Their plumage is short, hard, narrow and scanty, and the birds are firm-fleshed and muscular when handled. The standard weights are 11 lb. for matured cocks and 9 lb. for hens.

Varieties, Colour, and Markings. There are probably several varieties of the Malay because, like the Aseel and the Old English Game, a good bird in bright plumage can scarcely be a bad colour. However, the varieties described in the Poultry Club Standard are the Black-Red (generally known as the Red), the Pile, the Spangled, and the White. The Black-Red cock's head, hackles, back and wing bows are rich dark red, the secondaries bright bay when the wing is closed, and the remainder of his plumage is lustrous green-black. Hens to match this variety are any shade of cinnamon (free from ticking, spangling, or pencilling), with dark purple-tinted neck-hackle; or they may be Partridge or Clay as in Black-Red Game. The Pile is similar to the Pile Game—not merely stained white but of rich colour—and the Spangled and White as in Old English Game, the former a blending of red or chestnut with black and with bold white tips. In all varieties and both sexes the beak is yellow; the eyes may be pearl, yellow, or daw, while the comb, face and throat, wattles and ear-lobes are brilliant red, and the shanks rich yellow.

Utility Properties. The breed belongs to the general-purpose group; but the hens cannot be termed good layers, although better than is generally supposed. Pullets usually produce about fifty eggs before becoming broody. The eggs are inclined to be small, but they are brown-shelled and find a ready market. As sitters and mothers, the females are in every way satisfactory, since they remain with their chickens for many weeks and ably protect them from intruders. From a table point of view, its great size and fine grain of flesh render the Malay serviceable. The slightly yellow skin may detract from its appearance in some quarters; but the meat is white and of high quality. There is abundance of it, as the birds are plump. It is only when they are taken in hand that the extraordinary substance of these fowls about the breast, wings, and merrythought—which are the places to look for the desirable points of a table fowl—can be ascertained by the uninitiated in such matters. The cockerels do not equal the pullets for table purposes; but they are serviceable to cross with Dorkings for the production of heavy market birds.

Standard Requirements. The chief points in exhibition specimens are type (shoulders, curves, reach) and headgear, the former getting 36 per cent and the latter 16 per cent. A Malay amounts to little in the show pen without the characteristic cruel expression and the thick skull; too many birds nowadays of those which are exhibited have plain heads, altogether devoid of morose looks. Prominent shoulders are not considered of as much importance as they used to be, and more points are given for curves. Nevertheless, as an old breeder of Malays once remarked to me, "A bird ceases to deserve the name of Malay when

he carries himself like a Dorking." Feathering, legs, size, and condition are not regarded as very important, merely 9 per cent for each; but it is as well to recollect that hard and scanty feather is characteristic, and that too many show specimens are soft feathered. Size there should be, and accompanied by stout legs and shanks, so that the carriage may lack nothing.

The Malines (Sitter)

This Belgian breed has been kept for many years in the Province of Brabant, and suggests descent from the Asiatic breeds; it is known as "the white-fleshed Belgian table fowl," and there is very little if any difference between the Cuckoo variety and the recently boomed Holland or North Holland Blue. There was something of a craze for Malines in England a few years back, just as there has been for the Holland Blue this past season; but it was never a popular breed over here.

General Characteristics. The Malines' body is fairly long, broad, and deep, the back flat and sloping towards the tail, which is short but carried well up. The wings are short. The head is strong and the eyes are bright and intelligent. The legs are moderately long, the shanks lightly feathered to the outer toe, and the toes (four) are long, straight, and strong. According to the Poultry Club Standard the comb is single, straight and upright; but in Belgium there are "turkey-headed" Malines, which birds have triple or pea combs. The weights are given as 9 lb. for the matured cock and 7 lb. for the hen.

Varieties, Colour, and Markings. The only varieties standardized in England are Blue and Cuckoo, but several others are known, and they include Black, Ermine (similar to the light Brahma), Gilded Black, (practically like the Polecat Old English Game), Gilded Cuckoo, Silvered Black, and White, as well as "turkey-headed" in all colours. The Blue is one shade of that colour, as dark as possible, from head to tail, and devoid of lacing or black feathers, while the Cuckoo is blue-white, each feather barred across with bands of blue-black or black. The beak may be white or horn colour, and the eyes red or bright orange, but the comb, face, ear-lobes, and wattles must be red, and the legs and feet white.

Utility Properties. When the Malines has become acclimatized to this country, the birds are hardy enough for the south. Being of the general-purpose class, the hens are close sitters and careful mothers, and quite good layers of buff-tinted eggs. The chickens grow well and are active, while the cockerels are ready for table at an early age, and the pullets can be brought into lay at six months.

Standard Requirements. Type, including carriage, is the most important point in show birds, 45 per cent being allowed for it. Size ranks next, with 20 per cent, while colour (markings) and head points score 15 per cent each, and legs 5 per cent. The Malines is seldom on exhibition in England nowadays, possibly because it has given way to the Bresse; but the Cuckoo variety may perhaps have something of a vogue in the near future, since there has been a demand for Holland Blues.

The Marsh Daisy (Non-sitter)

The Marsh Daisy is a breed of English origin because it was "made" in a little village named Marshside, near Southport—hence Marsh, though why Daisy? However, the Poultry Club, ever anxious to please and never to offend, accepted its name and standard, and gave it official recognition. I have read "The History of the Marsh Daisy Fowl" in one of the year-books issued by the Marsh Daisy Club. It is a "regular rigmarole," if I may be permitted to say so with "no offence intended." Apparently, in 1913, according to that account, "an old man, over 80 years of age, kept a breed of fowls of wonderful stamina and laying power, and which seemed to thrive under the most wretched conditions" on marshy land. This old gentleman, so the story goes, "guarded the secret of the origin of the fowls very carefully, and would not sell either a bird or a fertile egg to anyone"—a non-progressive poultry-keeper, to be sure! However, it is said that the breed was obtained by blending Black Hamburghs, White Leghorns, Black-Red Old English Game, and Cinnamon Malay. Eventually Pit Game were introduced, and, later, the Sicilian Buttercup to get the white lobes and green legs. But, as can be imagined, it required considerable skill to establish the green legs.

General Characteristics. No matter to what extent one may go into detail, the fact remains that, to all intents and purposes, the Marsh Daisy is very similar to the Old English Game fowl in general characteristics, although it is claimed to be a non-sitter. The only point in which the two breeds differ is in the Daisy's rose comb which, on the male bird, is mentioned as of medium size, evenly spiked, and with a half-inch leader, straight out. The carriage is upright, bold and active, and the plumage semi-hard, and of fine texture, profuse feathering being detrimental. Male birds weigh 5½ lb. to 6½ lb., and females 4½ lb. to 5½ lb.

Varieties, Colour, and Markings. According to the Poultry Club Standard there are five varieties of the Marsh Daisy, viz. the Black, the Brown, the Buff, the Wheaten, and the White. No doubt, the Wheaten was the original, because those hens kept by the old man of Marshside were "a dirty pile colour, or should I say a floor-sand colour?" Black, Buff, and White

require little description, since in this breed the Black's plumage has a "beetle-green sheen in abundance," the Buff's is "golden buff throughout and buff to the skin," and the White is pure white.

The Brown cock is practically black and golden brown. His neck-hackle is rich gold, his back (and saddle) dark gold, and his tail black. His breast and all under-parts are black with patches or "spangles" —splashes, rather—of golden brown, with blue to

FIG. 167. A WHEATEN MARSH DAISY HEN

blue-grey undercolour. The wings of the cock are described as "bow, dark gold, same shade as back"; the coverts or bar, black; and the bay a flat brown.

The Brown hen's hackle is rich gold, and the tips of all feathers are black, "the whole to form a fringe at the cape." Her back and wings are brown, ticked or peppered with darker brown or flat black. Her breast and all under-parts are red-wheaten or salmon, a level shade, neither light nor too deep a red. Her tail is dull flat black.

The Wheaten cock (except for rich gold hackles, back, and wing bow, and beetle-green black tail) is golden brown, "the colour of a fairly dark bay horse." The hen to match him has a chestnut hackle, with black tips forming a fringe at the base of it; red wheat shoulders, back (upper), and wing bows; and light brown wing bar. Her breast is the colour of white wheat. The lower part of her back (to the root of the tail) is red wheat dappled with white. In all varieties the beak is horn coloured, the eyes are rich red with black pupil, the comb, face, and wattles red, the ear-lobes white, and the legs and feet pale willow green.

Utility Properties. For utility purposes the Marsh Daisy is a non-sitter, produces tinted eggs, and is good alike for laying and table. So much of these qualities was heard when this truly English breed first came before the public that it is surprising it is not among the most popular of the day. As it is, though, very few poultry-keepers are aware of its existence, while probably not a dozen, beyond members of the specialist club, could give a fair description of it. One enthusiast once remarked that it was "the utility fowl above all others, because no breed will produce hens that go on laying profitably for three or four years."

It has been said, also, that Marsh Daisies are "the birds that will thrive in a swamp." That being so, then the breed has in it qualities which should commend it to poultry-keepers. There is an official Laying Test record, about 1927, I think, of a pullet laying 213 eggs of $2\frac{5}{8}$ oz., in 48 weeks, while one member of the specialist club reported a seven-year-old hen averaging three and a half eggs a week from October to February, which same bird had produced "236 eggs in her pullet year, and had kept at it ever since."

The breed is a hardy one, and the chickens are easy to rear, given proper attention. They figure well on the table, because they are "built that way"—there is Old English Game blood in them. Cockerels can scale up to about 5 lb. in as many months, and they, like the Game fowl, carry plenty of breast meat—a good point in a table fowl, of course.

For Sex Linkage. Wheaten and Buff cockerels can be utilized with advantage for sex linkage; and when they are mated with Light Sussex hens, they produce buff or brown pullets and white or grey cockerels. These first-cross (sex-linked) males are very quick growers for table; they have white legs and skin, and their flesh is of excellent flavour. The pullets, too, are dependable layers, and they certainly possess stamina, which is such a strong point with the pure-bred Marsh Daisy.

Standard Requirements. Strange though it may appear, the most important part of the Marsh Daisy, according to the scale of points for the breed, is its head, which is allowed 33 per cent. Next to this come plumage (texture and colour) and condition, each with 20 per cent, while type is only 15 per cent, and legs 12 per cent. There is nothing particularly striking about the plumage of the breed, while in my opinion the head points are by no means difficult to breed to standard, except perhaps the white lobes.

But since want of type and legs other than willow green are considered as serious defects in specimens which are exhibited, then I should certainly rank type at 33 per cent, and legs as 20 per cent, on a level with plumage, thus reducing head points to 15 per cent and condition to 12 per cent.

The Minorca (Non-sitter)

Authentic records show that the Minorca has been known among poultry-keepers of the south-western

FIG. 168. A BLACK MINORCA COCKEREL

counties of England for considerably more than a century, in consequence of which some folk declare that the breed originated in Wessex. There can be little doubt, however, that it belongs to the Mediterranean races of fowl, those which are characterized by single combs and white ear-lobes, and being of particularly active habits. The females also show an almost entire absence of brooding propensities, a feature which has earned for them the title of non-sitters. We have it on reliable authority that the breed was imported from the island of Minorca (one of the Balearic group), which was a British possession in the latter half of the eighteenth century.

In the first edition of "The Illustrated Book of Poultry," the late Mr. Lewis Wright said that the Minorca, or Red-Faced Black Spanish, was probably the progenitor of the White-Faced Spanish. In another old poultry book which I possess, the breed is dismissed in the following sentence: "Minorcas are Black Spanish with red faces, the ear-lobe only being white, and differ in nothing else." In a third work—also published many years ago—it is referred to as "the fourth variety of the Spanish fowl," the other three, by the way, being the Black, the White, and the Andalusian.

At the beginning of the nineteenth century the Minorca appears to have been extremely popular throughout the whole west of England district. It was at that time practically the only laying fowl kept in Cornwall, Devon, Dorset, Somerset, Wilts, and Gloucester. As long ago as 1880, a Mr. Ledworthy, a well-known poultry-keeper residing at Barnstaple, in Devon, was breeding "most sub-varieties of the Spanish tribe." Of Minorcas he said—

> They are rather small in size; but very hardy, and good layers, laying nearly ten months in the year. The pullets hatched the latter end of March will generally commence laying the latter part of September, and continue during the winter, and on to the next moulting season. On calculation I have found them average as high as 200 per annum . and 1d. per week will keep them. . . The weight of the cock averages about 5½ lb., and of the hens 4½ lb.

It was not, however, until some years subsequently that the Minorca attracted much attention outside those south-western counties. But with altered conditions of travel, their popularity became assured. Classes were provided for them at the leading poultry shows; and in 1886 the Minorca Club was established. Prior to this, though, the breed had made much headway, albeit it was seldom found in the hands of fanciers. It had, nevertheless, established a great reputation as a layer long before it was taken up by the exhibitor. Like many another good breed, it has had its ups and downs. But despite the absurd craze among a certain section of the Fancy for abnormally large head points, and particularly lobes, the Minorca can still hold its own as a paying fowl. It could put up a very good record at a Laying Test, with little selection.

General Characteristics. Although the Minorca is the largest of the Mediterranean breeds, it belongs to the light and non-sitting class; hence there must be nothing coarse and heavy about it. This should be borne in mind, because it is not the build of the Modern Langshan. The body is fairly broad-fronted, and deep through, the breast full and round, and the back rather long, flat at the shoulders, and slightly tapering from front to rear. The keel is deep, and the breast-bone straight, with horizontal carriage. The wings are moderately long, and carried closely to the sides. The cock's tail is furnished with long and broad sickles, only moderately elevated, and carried at an angle of 40 degrees from the horizontal. The hen's tail is compact, very similar to that of the Leghorn, and neither whipped nor fully fanned.

The head is fairly long and broad, avoiding the length of the Game fowl and the breadth of the Malay, but sufficiently broad to permit of a good base of comb; and the expression is somewhat fiery. The comb may be single or rose, but always of medium size, and not "beefy." The single comb of the cock is upright, the back of it following, but not touching, the line of the neck-hackle; and it is evenly serrated with five or six wedge-shaped spikes. The hen's comb is carried over either side of the face, but so as not to obstruct her sight. The rose comb must be firm, and its leader (the back part of it) must follow the curve of the neck, and not be carried straight out or up. The ear-lobes are almond-shaped and the wattles oval, while the neck is long, with hackle feathers extending well down to the body. The legs, of medium length, are straight and wide apart, the shanks fine and free from feathers, and the toes (four) long and well spread.

The Minorca is a very active and alert fowl, with upright carriage and somewhat aggressive appearance. Its plumage is smooth, compact, and closely fitting all over, but not as taut as that of the Pit Game. The standard weights are: for cocks, 6 lb. to 8 lb., and for hens, 5 lb. to 7 lb. The former weight in each case is decidedly preferable for utility stock.

Varieties and Colour. There are two varieties, viz. the Black and the White. There was once a third, a Barred, made in Germany; but it never became popular in this country. A Blue has recently been exhibited in England, a variety produced by a fancier of other blue-plumaged fowls. In each kind both single comb (the original) and rose comb are allowed. This latter type in any breed of Mediterranean fowl is, in my opinion, a mistake; but it is officially recognized, and many typical rose-comb Minorcas are bred.

The Black's plumage is of the usual beetle-green sheen, free of any red in hackle or white in wing. That of the White is pure glossy white. The Blue, not yet standardized, is a self-colour, like the Blue Leghorn. In both sexes and all varieties the comb, face, and wattles are blood-red, and the ear-lobes perfectly white. In the Black and the Blue the beak is dark horn, the eyes are black or dark hazel, and the legs and feet black, or very dark slate—the latter in adult birds only. In the White the beak is white, the eyes are red, and the legs and feet pink-white.

Utility Properties. Regarded for utility, the Minorca takes a place in the front rank as a layer. It is not considered to be a good table fowl, although its offal is not abundant, while it compares favourably with some of the general-purpose birds. Its flesh is close and white; and a well-fed cockerel, when nicely dressed, is not to be despised. However, apart from its table properties, the breed pays if reared solely as a layer; and for this attribute alone it has gained a fine reputation. The females are non-sitters, and produce an abundance of large white-shelled eggs; in fact, the records for large eggs have generally been made by the Minorca.

At one time the breed was considered of too delicate a constitution to rank as a winter layer; but hardiness has always been one of its strong points. Consequently, when kept on the up-to-date semi-intensive

FIG. 169. A BLACK MINORCA HEN

system, it will give as good an account of itself as any other bird of its class. Minorcas will thrive on any land where fowls can be kept, whether at liberty or in confined runs. Being of an active disposition, they are first-rate foragers; and yet, for back-garden poultry-keepers, it would be difficult to find a more suitable breed. Then again, quick development is one of the good qualities they possess. It is common for spring-hatched pullets to commence laying at five months of age, which, surely, is early enough for anyone. It must be admitted, of course, that the craze for excessive points in some shows strains had a detrimental effect on utility properties. That, chiefly, was the cause of many poultry-keepers overlooking the fact that the Minorca is a great layer when properly selected.

For Sex Linkage. The White is useless for sex linkage, but the Black (male) can be linked with any Cuckoo or Barred variety of fowl. Thus, a sex link could be obtained by mating a Black Minorca cockerel with Barred Rock, Scots Grey, or Barred Wyandotte

hens. The first-named would be the most popular, undoubtedly. If the cockerel were the son of a good laying Minorca hen, i.e. a bird from a reliable egg strain, his pullet progeny (Minorca-Barred Rocks) should be much better producers than their mothers. This union might possibly affect egg colour. That is, the cross-bred (sex-linked) pullets would probably lay white, or, at best, tinted-shelled eggs. But they should be prolific producers of large eggs, if from carefully selected stock, and well reared.

Standard Requirements. For many years now the head of the Minorca has been considered as the chief point for show purposes, and to such an extent that 40 per cent is allowed for it. Colour (of the plumage, legs, eyes, and beak) ranks as 18 per cent, type as 17 per cent, size as 15 per cent, and condition as 10 per cent. The total for the head is made up by allotting 15 per cent to the face, 15 per cent to the comb, and 10 per cent to the lobes. It is certainly necessary that the face be blood-red, and free of white spots or a blue tinge; and yet I have seen quite gipsy-faced birds winning in keen competition. The comb must be firm, so firm that it stands perfectly erect on the male, and falls gracefully over to either side of the female's face, in each case having sufficient substance to obviate any flabby and lifeless appearance. The lobes should be almond-shaped, widest at the top, of kid-like texture, flat but full, not hollow or dished, fitting closely to the head and not extending over the face. All these points, nevertheless, are of very little use outside exhibition circles; and it is because so much stress has been laid on their perfection that exaggerations have occurred to the detriment of the breed's great laying properties. Such head-gear as is frequently seen on the champions of the show pen would be burdensome to layers and lead to poor winter production. The Minorca was originally a very active fowl; and so it should be bred for heavy production.

The Norfolk Grey (Sitter)

The breed now known as the Norfolk Grey was produced in England and first exhibited at the Dairy Show of 1920. Hence, it can scarcely be classed among the old ones. It has, however, passed well out of the "new" stage, because the originator of it had in his possession, before the War, better specimens than those first seen by the public. For some reason, nevertheless, he preferred to hide their light under a bushel. And yet, when he exposed the light, he appeared to do so as a huge joke. At any rate, that is how it struck me at the time, because he gave the breed a name which certainly reminded one of prison life! Black Maria was its title when it was first shown. It was not altogether a taking name and perhaps that is why the public passed it by. Later it was changed to the Marea, and subsequently—in December, 1925, I believe—to the Norfolk Grey.

Of its origin, Mr. F. W. Myhill, who brought it into existence, once wrote, "I have been asked several times for a history of their evolution, but that must remain a secret." When the Grey was first exhibited, a good many fanciers suggested that this or that breed had been used; but "the guesses were mostly very wide." As a matter of fact, the originator himself admitted that "there is a 'missing link,' even as far as I am concerned." Owing to the War, in which Mr. Myhill was actively engaged, his poultry were practically left to themselves, and he nearly lost the breed.

Shortly after the Black Maria became known, there appeared an illustration of a cockerel which had been shown at the Dairy and Birmingham. This brought a communication from a poultry-keeper (Miss G. B. D. Finch Dawson, Burwain Hall, near Penrith) to the effect that since 1917 she had been breeding birds similar to Black Marias. "My mother and I thought they were unique," she wrote, "and have named them 'Black Burwains'! . . . So far they have bred true to type." It may be as well to remark, however, that that is the only mention I can trace of the Cumberland breed; so presumably it was not popularized.

In connexion with the origin of the name Mr. Myhill said that the one he gave his new breed "originated from the war names of German shells, which were so often spoken of as 'Jack Johnsons' or 'Black Marias' in the early days." There is certainly a connexion between shells and fowls. But, although the originator considered it "a nice, homely name for a nice fowl," it did not appeal; hence the more appropriate county title.

General Characteristics. Although the Grey is classified in the Poultry Club Standard as a sitter—which means that it is a general-purpose fowl—the birds are nearer light than heavy. In body formation they remind me somewhat of a Sumatra Game and Dorking union, but they are nothing like as massive as this latter English breed. Their originator described his early specimens as, in shape, somewhat like a cross between a Dorking and a Wyandotte, and that would make them cobby.

However, the body is rather long compared with its depth, and well rounded in front. The wings are large, and closely tucked up, while the tail, when fully furnished, is carried somewhat low, but not drooping. The legs are inclined to be short, with the thighs almost out of sight. The shanks are free from feathers, and the toes (four) are well spread.

The comb is single, upright, and well serrated, but somewhat small. The face is smooth, and the beak short and curved. The eyes are bold, and the ear-lobes

small and oval. The wattles are long and fine in the male, but almost round in the female. The neck is of medium length, abundantly covered with hackle feathers, while the saddle-hackle of the cock is also profuse. The carriage is alert, the breed being decidedly active, while the plumage is close. Standard weights are: Cock 7 lb. to 8 lb., and hen 5 lb. to 6 lb. In my opinion, the former should be the maximum in each sex, although I must admit that the Grey is heavier in hand than it appears on the ground.

Variety, Colour, and Markings. It is almost unnecessary to say that there is only one variety; and, although it was called a Black at first, it is now a Grey. It is, as a matter of fact, a Birchen-Grey, and very similar to the Game of that variety. Grey can be of various shades, but the colour of the Norfolk is similar to the Birchen Game.

The hackles, back, shoulders, coverts, and wing bars of the cock are silver-white (old coinage), the hackles having black (centre) striping, and the remainder of the plumage is black. The hen's neck-hackle is similar to the cock's, but her throat (and often the top part of the front) is delicately laced with silver. Otherwise the bird is black. As a matter of fact, in colour and markings, the Norfolk Grey should follow the Birchen Game as nearly as possible. In both sexes the beak is dark horn colour. The eyes are very dark, practically black; the comb, face, ear-lobes, and wattles, red; and the legs and feet black or slate-black, the former preferred.

Utility Properties. For strictly utility purposes, the breed is better as a table fowl than a layer. It is hardy and very active; and the chickens furnish up at an early age. They have white flesh and a rather long breast; and they carry plenty of meat. Hence their suitability for market. When hatched in the spring of the year the pullets are reliable winter layers of good-sized eggs; and, since they are brown-shelled, they find a ready sale. If the Norfolk Grey were only more widely bred, I feel sure it could be developed into an excellent breed for farm use. At present, however, it is not much known, even in the county of its origin. But it is well worth taking in hand.

Standard Requirements. For the purposes of exhibition, colour and markings take first place in this breed, and, combined, they amount to 45 per cent. Next to them come type and size 20 per cent, head points 15 per cent, condition 10 per cent, and legs (and feet) and tail 5 per cent each. I am so strong on type in most breeds that I should feel inclined to alter some of the scale of points for the Norfolk Grey. Thus, type alone would get 20 per cent, size 15 per cent, and the other four minor sections, viz. head, legs, tail, and condition 5 per cent each. Colour and markings are certainly of importance in this breed.

The Old English Pheasant Fowl (Non-sitter)

It can be scarcely more than ten years since the Old English Pheasant fowl was resuscitated, and brought to the notice of the British public by a few ardent fanciers forming a club for it. And yet, short as is that time, the breed appears to have dropped back into obscurity once again, so little is heard of it, and so rarely does one see it at the shows. It is one of our oldest breeds; and it is well known in the North, where it has been kept for generations by the Fell farmers, and purely for eggs and its hardy constitution. There is not the least doubt that it is an old-established standard-bred and purely English breed; and it can be traced back well over one hundred years. The standard for it was long since adopted by the Poultry Club.

Of its origin little appears to be known. Some folk imagine that it originated in a cross with the wild pheasant. But this is not so; it is called a Pheasant fowl because it resembles the colour of the breast of the wild cock pheasant. It has been suggested that there is some connexion between the Pheasant fowl and the Hamburgh. No doubt there is, or, at any rate, there was years ago; and, likely enough, the Pheasant was the original Gold-Spangled Hamburgh.

One has to admit that in the early days of the Hamburgh, prior to the show era, this breed was very extensively—and for some years almost exclusively—cultivated in Lancashire and Yorkshire. And in those counties the Hamburgh was known by different names—for instance, in the former as the Mooney, and in the county of broad acres as the Pheasant fowl. Thus we find that the Black Hamburgh was called the Black Pheasant fowl, and the Spangled varieties the Gold and the Silver Pheasant fowls. However, as bred to-day to their recognized standards, the Old English Pheasant fowl and the Hamburgh are quite distinct kinds, and the show points of each breed are now fairly well fixed.

General Characteristics. The Old English Pheasant fowl has well been described as a nicely-balanced bird without any exaggeration, an alert-looking, well-made fowl. Classed as a non-sitter, the breed is probably better for egg production than for table; and yet for this latter it should not be discarded. As a matter of fact, the Pheasant is good for both purposes.

Its body is rather long, deep and round, the shoulders prominent, the tail flowing and set well back, and the legs of medium length. The shanks are free of feathers, and the toes (four) well spread. The head is fine and the comb is of the rose type, of moderate size and fine texture, firmly set on, square-fronted, flat-topped (though with plenty of work), and the spike at the back turning downwards. The eyes are bright

and prominent. The face and wattles are smooth, free from wrinkles; and the ear-lobes, of medium size, are oval or almond-shaped and smooth. The carriage is alert and active. The Pheasant is a springy bird, made for work. Standard weights are: Cocks 6 lb. to 7 lb., cockerels and hens 5 lb. to 6 lb., and pullets $4\frac{1}{2}$ lb. to 5 lb. In my opinion, 7 lb. cocks would be too heavy.

Varieties, Colour, and Markings. According to the Poultry Club Standard, there is only one variety of the

FIG. 170. AN OLD ENGLISH PHEASANT FOWL COCKEREL

Old English Pheasant fowl, and that one a Gold. It is, however, simply called by its breed name, no doubt to prevent the public getting it mixed with the Golden Pheasant—a fancy breed of pheasant.

With one variety only, there is one "colour" only, and that is bright rich bay. But the lacing, bars, striping, tipping, and spangling are beetle-green black. The male bird's tail is solid black, devoid of markings, but with a green gloss on the sickles and hangers. His hackles are striped and slightly tipped, those of his saddle being a shade darker than his neck-hackle. His breast is laced (with black); and there are two wing bars on each side, "marked"—generally spangled in crescent form, and not merely splashed across.

The hen's neck has a heavy stripe down the centre of each feather; and her tail has a slight edging of bright rich bay carried up from the base along the upper edge. Her wing bars are of distinct crescent spangling—even and well-marked bars are a point of great beauty. Each feather of the remainder of her plumage is tipped with a crescent-shaped spangle. Dark, rich-coloured Pheasant fowls are most in favour, because dark bay is the real old colour. A pale-coloured bird is not very attractive in the show pen. In both sexes the beak is horn-coloured, and the comb bright rich red. The eyes are fiery red, the face and wattles like the comb, the ear-lobes white, and the legs and feet slate-blue.

Utility Properties. For utility, as I have said, the Old English Pheasant fowl can be classed as an all-rounder. Being of the non-sitting class, the eggs are generally white-shelled; sometimes they are tinted. The birds are great layers of 2 oz. eggs from the start, while the hens produce $2\frac{1}{2}$ oz. eggs as a rule. Spring-hatched pullets begin in winter, and lay well into the following autumn. A properly bred, fed and reared pullet should produce the standard egg when coming into lay. She is a poor specimen who does not reach 200 eggs in her first laying year. The length of the laying period is advantageous, because the birds are in production when other light breeds are moulting as a rule—a time of year when eggs are apt to be scarce.

They moult quickly, and soon start laying again, especially if they are housed in a substantial building and are given nourishing food. Some people give them credit for being small eaters; but they can and will devour as much food as other birds which are laying. Cockerels are easily disposed of for table, because, if well fed, they make plump fowls at three to four months of age. The colour of the breed is such that it does not show the dirt; hence the birds can be confined to suburban back gardens. Being great foragers, however, they thrive best when they have their liberty; and when so kept, on free range, they find much food.

Now, since they possess so many really good qualities, the novice may well wonder why the Old English Pheasant fowl has not become popular throughout the country. There is only one reason—it does not come into lay as quickly as most of the better-known breeds. Pullets are generally seven months old before they start producing eggs—and older than that if they are hatched late in spring. No matter if they do commence with standard weight eggs, they are well behind Leghorns, Anconas, Minorcas, Bresse, and other breeds of their own stamp in beginning. Personally, I consider it a point in their favour—it enables them to make good growth of body and store up plenty of energy. It ensures their being stayers, and producing for a full twelve months from the start. But poultry-keepers who want eggs cannot wait so long.

Standard Requirements. The scale of points formed in connexion with the standard for this breed is quite

a good one. For instance, 25 per cent is the allowance for the head, 20 per cent each for type and markings, 15 per cent for ground colour (of the body), 10 per cent for quality and flow of feather, and 5 per cent each for size and condition. The comb must be firmly set on the head, because if it hangs over either side of the face it constitutes a serious defect in the show bird, as does any "blushing" or red marks on the lobes. It will be observed, also, that some encouragement is given to produce the beautiful, because colour and markings mount up to 35 per cent, and this combined with the allowance for the head gives a level of 60 points out of a 100.

The Orloff (Sitter)

The Orloff is said to be an ancient Russian breed, "made" by a Prince Orloff in the early part of the eighteenth century. It was not until 1911, however, that specimens were seen in England, since in that year a trio of the Mahogany variety was imported by a Devonshire poultry fancier; and two years later fair numbers of Orloffs were to be found in that county and in Yorkshire. I have kept most breeds of poultry in my time, but this is one of the few of which I have had no practical experience; and the only times it came through my hands were when I was judging at the shows. However, it never had a great vogue; and all attempts to popularize it—even to the extent of forming a special club for the purpose, and getting its standard recognized by the Poultry Club—failed to make it widely known. There was lacking from it that which appealed to the fancier, and certainly little in it to commend it to the average poultry-keeper. If ever a breed of fowl merited the term "ugly" that breed would be the Orloff, because of its gloomy vindictive expression, and the "face fungus" with which it is adorned; but, in my opinion, there are no really ugly fowls.

General Characteristics. The cock's body is broad and fairly long, the back flat and slightly sloping to the tail, the breast full and prominent, the wings closely carried, the tail erect and fan-like and with long narrow sickles, and the legs of medium length and stout, and the toes (four) long and well spread. The head and neck may be said to be the outstanding features of the Orloff. Not only is the comb of the raspberry stamp—similar to a raspberry cut through its axis lengthwise—covered with small protuberances mingled with small bristle-like feathers, and the face muffled with well-developed beard and whiskers, but the beak is short and hooked, the skull is wide, and the eyes are full and deeply set under projecting eyebrows (beetle brows), which give the bird that gloomy and vindictive expression to which I have already referred. The neck, too, is fairly long and erect—the whole carriage of the bird is upright, with slightly sloping back—but while it is heavily hackled, the feathers are very full at the top and so close at the base (of the neck) as to make them appear thin there, and they form a distinct angle with the back. Another peculiarity is that the wattles are seen in the male bird only, while his ear-lobes are hidden under his muffles. The hen's muffling is more profuse than the cock's, she has more bristles on her comb, and her tail is comparatively long. The standard weights are as follows: Matured cock 8 lb., cockerel 7 lb., hen 6 lb., and pullet 5 lb.

Varieties, Colour, and Markings. Four varieties are standardized by the Poultry Club, viz. the Black, the Mahogany, the Spangled, and the White. The first and the last need no description, since the one is solid black to the skin with a beetle-green sheen on the surface, and the other lustrous white from head to tail. The Mahogany cock's body plumage is rich mahogany, his neck-hackle rich dark orange—darker at the crown and with slight black stripes at the base only—his saddle shading to deep orange, his wings with a strongly defined black bar, his mufflings of three colours (black, mahogany, and grey), and his breast and tail solid black. The hen's mufflings are similar to those of the cock; otherwise she is of a rich dark mahogany colour, uniformly peppered with black. The Spangled cock is also of a rich mahogany colour, his hackles (neck and saddle) having small white tips to as many feathers as possible, his wings having a black bar and white flights, his breast being black with white tips, and his tail solid black. The hen to match him is of a light mahogany shade, with white tips, the spangling being as uniform as possible. In all varieties of the Orloff, the beak is yellow with a thin rose-tinted skin at its base and around the nostrils. The eyes may be red or amber, but the comb, face and wattles are red, and the legs rich yellow.

Utility Properties. The breed belongs to the general-purpose class. The hens lay nice-sized white or tinted eggs, but not a great quantity of them, while the cockerels make quite good table fowls, the flesh being of fine texture, and white. The females rarely become broody, although they are classed as sitters; and the chickens, being hardy, are easy to rear.

Standard Requirements. The standard for this breed does not contain the usual scale of points. Colour is said to be of secondary importance, which is just as well, because it has always been the difficulty of the breed from an exhibition aspect. The main characteristics are its peculiarities of head, particularly the comb and muffling, the body shape, and the upright carriage. The Orloff, nevertheless, is not a breed likely to appeal to beginners.

The Orpington (Sitter)

The Orpington was produced about the year 1880 by the late Mr. William Cook during his residence at Orpington, in Kent. Without going into a lot of unnecessary details it may be said that, in the "manufacture" of its several varieties, such breeds as Buff Cochins, Red, Dark, and White Dorkings, Golden-Spangled Hamburghs, Croad Langshans, White Leghorns, Black Minorcas, Spangled Old English Game, and Barred and Black Plymouth Rocks were included. There may have been others, but it really does not matter, because it required a very considerable knowledge of breeding, to say nothing of extreme patience, to evolve from so many different kinds such a fine fowl as the Orpington. Despite the diversity of the breeds used in its formation the Orpington is English, no matter whether bred for beauty, flesh, or eggs. It was originated as a back-yarder's fowl, solely for utility purposes, and it proved to be a particularly useful kind.

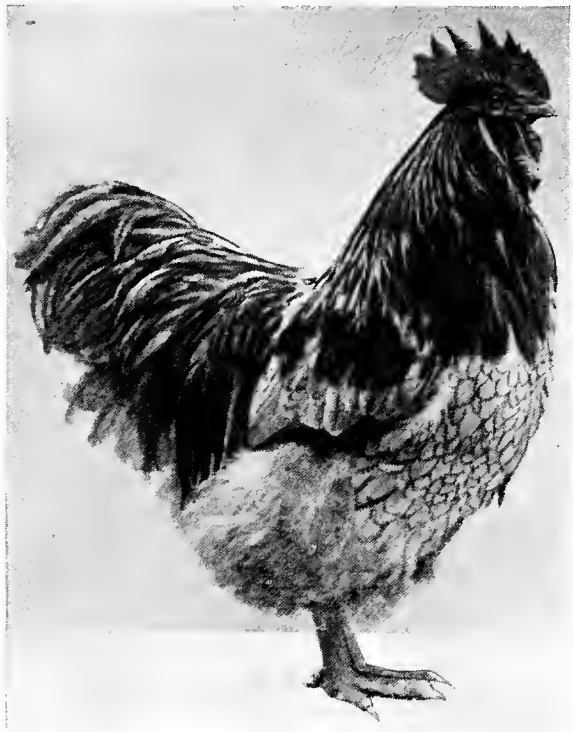


FIG. 171. A BLUE ORPINGTON COCKEREL

This cockerel, which won first prize and several special prizes at a Crystal Palace Show in his first season, is not only a fine specimen of his variety for colour and markings, but he possesses in a marked degree all the general characteristics required in a standard-bred Orpington for exhibition. His carriage is graceful and his balance correct, while he shows vigour and does not carry too much feather

Fanciers and exhibitors took it up some years after its introduction, and it had to pass through the acid, probably as no other breed ever did or ever will do. Still, it came through with honours, because it came to stay. During the many years the Orpington has been before the public, it has been in and out of favour, while it has been developed from a rather closely-plumaged fowl into one which, in fanciers' parlance, has "a wealth of feather." Because of this, therefore, the present exhibition type, although referred to simply as the Orpington, should be termed the Modern Orpington. At any rate, since there is another stamp of the breed, which I will describe later on—as well as the Australorp, dealt with earlier in this chapter—the use of the prefix "Modern" would, I feel sure, give novices a better idea of the kind required for show purposes. It is as well to recollect that the exhibition Orpington has been as much altered from the original type of 1880 as the Modern from the Croad Langshan, or the Cochin of to-day from the Cochin of 1840. Improvements such as these are almost invariably made when fanciers take a keen interest in a breed.

General Characteristics. The breed belongs to the general-purpose class, those fowls which are frequently called sitters or heavies, sometimes dual-purpose breeds, and occasionally all-purpose birds. They are not as a rule equal in number of eggs to the non-sitters, but decidedly superior as eaters. The Orpington's body is broad and deep, the breast well rounded, the back wide across the shoulders and saddle (or cushion of the hen), fairly short, and rising gradually to the tail, which is small and inclined backwards—a low and drooping tail is not in keeping with a "cobby" bird. The head is fine, the expression intelligent without any indication of fullness over the eyes, and the face smooth. The comb, ear-lobes, and wattles are small.

The neck is rather short and full hackled, the feathers of it covering the shoulders, so that, with the slightly rising saddle (or cushion), the top outline of the bird is a graceful concave curve from the base of the comb to the highest part of the tail, but the top of the tail should not be as high as the comb, even in hens. While the back is apparently short, the neck-hackle must not touch the saddle or the cushion; just as the hen's cushion should be almost flat, rather concave than convex, and certainly not round or ball-shaped. The legs are strong and fairly short, the thighs partially hidden by the body feathering, the shanks and toes (four) smooth and free from feather, and the feet well spread. It should be noted that fowls with very short backs and legs are absolutely useless for utility purposes, being neither good breeders nor prolific layers.

The bearing of the Orpington is graceful, as befits an active fowl, while the plumage is close—neither

loose, fluffy, and "hollow," nor as hard as parchment —and the flesh firm when handled. The standard weights of matured cocks are 9 lb., and hens 7 lb., but many of the best birds do not reach such weights. As a matter of fact, the great size of some show specimens depends much on the way the exhibitors "fluff" them for the pen. But breeders should remember that the Orpington is not a clean-legged Cochin; and it is this absurd craze for excessive feather which has almost ruined some strains for practical purposes. There is very little commercial value in feathers; and even if the most soft-feathered specimens which one sees were bred solely for their down—which, of course, is not the case—it would not be a profitable undertaking, though eider-duck prices were paid.

Admittedly, some experts who handle layers for exhibition do demand a certain amount of fluff or silky feathering; but the best of them can have too much of a good thing. Close plumage is a characteristic of the Orpington. It may be remarked that breeding for excessive feathering, and aiming to get this feature altogether beyond the limits of the standard, did much to force those who viewed the Orpington as a utility fowl to form the Old Type Orpington Club. With the demand for utility, however, and particularly by the adoption of a sane standard for the judging of birds in utility classes, the Orpington is being gradually brought back to a much more workable type; and many fanciers are now breeding and showing stock which will pay to be kept solely for eggs and meat.

Varieties, Colour, and Markings. There have been ten varieties of this breed, viz. the Black, the Blue, the Buff, the Cuckoo, the Jubilee, the Partridge, the Pile, the Red, the Spangled, and the White; and, although the first Orpington was single-combed, the rose comb is also allowed. Few rose-combed specimens, however, are seen nowadays, while the Black, the Blue, the Buff, and the White are the only varieties which are bred to any extent, little being heard of the other six.

The plumage of the Black is black with a dark green sheen; of the Blue medium slate-blue, dark on the hackles, wing bows, back and tail of the cock, and laced with a dark shade on the rest of his plumage, laced throughout on the hen, except on her head and neck, which are dark slate-blue; of the Buff, a clear, sound, even shade throughout to the skin; and of the White, pure snow white. In all varieties the comb, face, ear-lobes and wattles are red, but other points vary as follows: Beak, eyes, legs and feet black in the Black; beak blue, eyes black, legs and feet blue or black in the Blue; beak white or horn, eyes red, legs and feet white in the Buff and the White.

Utility Properties. As a utility fowl the Orpington ranks high in that class known as general-purpose breeds; and in three distinct ways. In all its varieties it is a fleshy bird, and few can equal it from a table point of view. As "peckers" or "runners"—picked straight out of a pen, fasted, and killed without extra feeding—cockerels can be brought to scale up to 5 lb. at three-and-a-half months, and over 6 lb. at five

FIG. 172. A BUFF ORPINGTON COCK

months. As "half-fattened" chickens, cooped and hand-fed for a month or two, they scale heavier still, while if crammed specially for the table—and being of a docile nature the birds lend themselves well to the cramming process of fattening—they have attained remarkable weights and have been mistaken for turkeys.

The excellent amount of white flesh on the breast, the thin and fine texture of the skin, and, in the Buffs and Whites, the whiteness of the shanks, render these two varieties especially good, marketable fowls, since they can be dressed to please the eye—a great point with table birds. The Black and the Blue, too, leave little to be desired, because, although their shanks are black or nearly so, their skin is white; and those people who have no objection to fowls with black legs will find them highly serviceable.

As layers, and thoroughly reliable winter egg producers if hatched early in spring, the pullets are extremely good when properly treated; and by this I mean when given plenty of hard exercise in their growing stage, and brought along on the very minima of fatty foods. The eggs are of ideal size and weight —I have had them in plenty going well over the 2 oz. —while the shells generally are brown. There is a slight difference as regards laying qualities in the four varieties, the Buff probably being at the top, and the

Fig. 173. A White Orpington Hen

Black at the bottom. Nevertheless, it is a question of management to a great extent; and, given the right kind, the Orpington can be depended on to begin early in winter, often in late autumn, and to continue until the end of spring with scarcely a break.

It must not be forgotten that the Buff has figured well in laying competitions, and such scores as 103 eggs in 112 days and 342 in 352 days have been their records. The other colours, too, can compare very favourably with breeds of their class. By careful selection it would not take many years to make the Black every bit as good an egg producer as the Australorp. It is merely a question of picking for laying points rather than feather.

For sitting and hatching, too, the Orpington hen is most dependable, no matter what her colour, since she can cover a full nest of eggs and look well after her chickens. I have invariably found her docile to handle, and a truly responsible "Biddy" when rearing her young. She will sit closely, make no fuss when approached, guard her chickens as jealously as a Game hen, and remain with them until they are well grown. To some poultry-keepers this brooding propensity may appear to be against the breed. Still, it is one which can be checked; and a broody hen is soon "broken" if taken in time.

The chickens are hardy, and grow at an amazing pace if given plenty of exercise and the right kind of food. It is just a question of reasonable care and attention. Maybe some readers will think I have "stretched a point or two" in my remarks about the Orpington; but it is not so. The breed is one of the best ever produced; and the sooner some breeders recognize that it is not a clean-legged Cochin, and never was intended to be when it was "made," the better it will be for the Orpington.

For Sex Linkage. Both the Black and the Buff can be used for sex linkage on the male side; but I question if the White is a true enough "silver" to be linked with any breed or variety of "gold" cock for the purpose. I have certainly not tried the Orpington for sex linkage.

Standard Requirements. Type is the most important point in this breed when it is exhibited to standard, although the percentage allowed for it differs according to the variety. Thus, in the Black it is 40, in the Buff and the White 30, and in the Blue 25. In the Black, head points rank next, as 25 per cent; while colour (combined with condition) and size get 10 per cent each, and minor points, such as legs (and feet), tail, and skin 5 per cent each. In the Blue, colour and markings are level with type as 25 per cent, while size is given 20 per cent, and head, legs (and feet) and condition 10 per cent each. In the other varieties, colour counts as 20 per cent, head and condition as 15 per cent each, and size and legs as 10 per cent. There should be nothing coarse about the Orpington, and even the heaviest specimen should not be stout-boned or heavy-headed; there should be no "beetle" brows, the eyes being prominent and bright. The plumage, too, should be closely fitting, the feathering of an active fowl, and it is a great mistake to imagine it should be soft and fluffed out, for such is not included in the standard. Admittedly, some old hens become very fat; but such specimens should not be encouraged by judges. Type is the chief point, and it should certainly be the first consideration.

The Old Type Orpington (Sitter)

As the Australorp and the Orpington have already been dealt with, the fowl which is known as the Old Type Orpington cannot be ignored in a work of this description. The Old Type is said by some poultry-breeders to be the original stamp of the Kent breed

which was produced by the late William Cook. On the other hand, there are those who contend that the Orpington of the show pen, as fostered by the four single-variety specialist clubs, is the original. In the view of these latter there cannot possibly be any other kind; that is, no other Orpington can be legitimately standardized. However, viewed dispassionately, there is really no reason why two distinct types should not be fully standardized.

Admittedly, those who fancy each kind assert that they are breeding and exhibiting their birds to the one standard, that of the Poultry Club. Some go so far as to state that both stamps can be bred from the one pen, which, though, is scarcely correct, because the two differ considerably. But seriously, why should there not be two types of the Orpington? We find two types, for instance, in Langshans and in Game, and they have existed for many years. The original Langshan is known as the Croad, and the other, in the Fancy at any rate, as the Modern.

Of Game, there are the Old English and the Modern; and even two stamps of the former, because there are Pit Game, and Old English bred solely for the show pen. Both in Langshans and in Game, each section has its own clubs and standards, which are recognized by the Poultry Club. Similarly, in Orpingtons two distinct types actually exist, although for some reason difficult to understand this state of affairs is not officially acknowledged by the Poultry Club —except that one variety of the original has got into the Standard as the Australorp. Nevertheless, the original has been popularized in England since 1927 as the Old Type, and the other—by the poultry Fancy, at any rate—as the Orpington. But, as both of them sprang from the same source, each type is fully entitled to its breed name.

As far as I can see, the difficulty would be to differentiate between this old type and the Australorp. As a matter of fact there can scarcely be any difference, because both are claimed to be the original Cook Orpington. Candidly, though, each is an improvement on the original of 1880, because in its early days the Orpington lacked definition as regards type. Moreover, the best of those which were first exhibited could not compare with the birds we are in the habit of seeing to-day. But whereas the Australorp—which was first known as Australia's utility Black Orpington —became famous solely as a layer, the Old Type Orpington made its name and retains its reputation along the originator's lines—the breed was made and placed on the market at a time when there was a large demand for a good general-purpose fowl.

Since the origin of the Old Type Orpington is the same as that of the Orpington which has just been dealt with, there is no need to say anything about it now. Those who favour it and formed the Old Type Orpington Club have as their object, "To restore the Orpington to its former popularity as the leading dual-purpose breed"; and in view of the fact that the Orpington of the show pen has gone out of favour to a large extent of recent times, that object is a most commendable one.

General Characteristics. For some years after its formation, the Old Type Orpington Club appeared to be satisfied that the Poultry Club Standard was good enough for its members. That Standard enabled them, they said, to obtain in the breed dual-purpose properties, that is, high egg-laying abilities and first-rate table quality, together with handsome appearance. Nevertheless, since no breed has yet been able to make headway without a standard—because, in such circumstances, the beginner is at a loss to know what are the desirable points for which to breed—the specialist club has now issued its Standard. This, as might be expected, differs only very slightly from the one published by the Poultry Club; but it emphasizes the fact that the plumage must be close, the eyes intelligent, and the legs, while being fairly short, must not have the shanks hidden in any way by excessive thigh feathering. The carriage, too, must be bold and upright.

If the two stamps now before the public are compared, it will be found that the Old Type is not as massive-looking as the other, because it does not carry as much feather. It is, indeed, close, almost hard, feathered and very compact, weighing more on the scales than is apparent in the show pen, because matured cockerels scale 8 lb. to 10 lb., and pullets 6 lb. to 8 lb. Its back is nothing like as short, while the Old Type shows practically the whole of its thigh (*tibia fibula*) and not the lower part of its shank only, or merely its feet.

This utility stamp of Orpington, for such it is, has a more workmanlike appearance, and is more active than some of the exhibition Orpingtons of to-day, although many of these highly-bred strains, particularly of the Buff and the White, do produce birds of real dual utility value—pullets which lay well and cockerels which make prime table chickens. Still, broadly speaking, one might say that the Old represents the hunter among fowls and the other the shire. Both, undoubtedly, have their uses, while each is beautiful when penned for exhibition.

Varieties, Colour, and Markings. Four varieties are fostered, and they are the Black, the Blue, the Buff, and the White. In each, as regards colour of plumage, head points, legs, etc., the Poultry Club Standard for the Orpington is adopted; and since the points have already been dealt with there is no need to repeat them.

Utility Properties. It is in utility properties where the Old Type Orpington scores. As we know, the breed was brought out strictly for utility purposes, and it soon became popular for its laying and table qualities and its extreme hardiness. But, good as they were, the present Old Type, through the use of the trap nest and careful selection, is a vast improvement on the original. Although not intended to be a super producer, records of the Laying Tests since their inauguration in 1897 reveal that the breed made a good showing from 1899 to 1910, while of quite recent years it has more than held its own. In one of the late tests a pen of Buffs of the Old Type averaged over 212 eggs a bird.

Taken as a whole it is as good as any general-purpose breed we have to-day. As layers, the hens and pullets are extremely satisfactory; the eggs are of fine size, and generally with deep brown shells. The females are steady sitters, careful mothers and quiet to handle. Broodiness, of course, is an inherited factor, but if necessary it can be almost entirely eliminated by careful selection. Chickens give little trouble when managed on common-sense lines, and they mature steadily. For table they can be grown in a most satisfactory manner. When fed with that end in view, they "fleshen up" on the best parts; and if killed at from three to four months they make excellent spring chickens for the market. Being of a docile disposition the birds can be finished off by cramming—they lend themselves well to that process of fattening. The thin and fine texture of their skin and the whiteness of the shanks of the Buff and White render them especially good for the top markets. The Old Type Orpington is of exceedingly hardy constitution, while the smallness of its head appendages fits it for a cold climate. The birds are great foragers, and for the poultry-keeper who has a wide range and desires a dependable all-round breed, they possess every quality which is needed. The back-garden enthusiast will also find them suitable for his purpose.

Standard Requirements. Since the object of the Old Type Orpington Club is to foster the utility properties of the breed, they are mentioned in that Club's Standard, and are as follows: Breastbone to be long and straight; fluff at abdomen and thighs, fine and of silky quality; skin at abdomen, soft and yielding to the touch, not hard and solid; abdomen full, but not to overlap the breastbone; quality of bone, flesh, feather and skin to be valued as utility qualities. In the scale of points, however, type is the most important part, and it gets 25 per cent. Size, colour, and utility qualities are allowed 15 per cent each, and head, legs (and feet), and condition 10 per cent each. This scale of points prevails no matter which variety of the Old Type Orpington is being considered. Hence, type, which, according to the Club's Standard, includes carriage, plumage, and handling, is the point for which to breed.

The Plymouth Rock (Sitter)

Although the Plymouth Rock has a distinctly English name—Plymouth is in Devonshire, as we are aware—the breed was undoubtedly originated in America. As far as can be ascertained, it came out in 1850, a fowl being so called by Dr. J. C. Bennett, a well-known breeder and writer on poultry subjects in that country. In all probability it was called after Plymouth Co., Mass., the oldest town in New England. For many years after its debut, however, the breed was practically unknown outside the New England States. Not until 1870, in fact, was it again brought to the front in America, and then in a vastly different form. It is said that Dr. Bennett produced it "by crossing a Cochin China cockerel with a hen that was herself a cross between the fawn coloured Dorking, the great Malay, and the Wild Indian"—this last-named breed probably being the Indian Jungle fowl. According to the Doctor, his breed was "in reality one-half Cochin China, one-fourth fawn coloured Dorking, one-eighth great Malay, and one-eighth Wild Indian."

This is no doubt interesting; but that Plymouth Rock of 1850 could have been little removed from a mongrel. For instance, while its plumage was described as rich and variegated, the male birds were usually red and speckled and the females dark brown and grey with blue bars. They mostly had blue or green legs, but in some the shanks were yellow or white. In addition to such variations, too, the feet of some were five-toed and of others four-toed, while, apparently, the shanks could be feathered or featherless. Hence, compared with the breed as we know it, or as it reached England in 1872, Dr. Bennett's can be dismissed as a Plymouth Rock in name only.

The produce of 1870—and who was responsible for it no one can say—was undoubtedly evolved from the old-fashioned native Dominique (the common cuckoo marked fowl of America) and the Black Java. The Dominique was, at the time, the best general-purpose kind in America, while the Black Java was generally a prolific layer. So these two were blended. The first Plymouth Rocks ever seen in England were in 1872. They took honours at the Birmingham Show that year in the Any Other Variety class—where so many of the more recent breeds have first attracted the public. Shortly after its introduction to English poultry circles the Rock enjoyed a boom almost equal to the craze for Cochins.

The breed of those days, however, and as I first recollect it nearly half a century back, differed vastly

from the modern Rock of our shows. It was, in truth, "a plain, comely and honest-looking fowl," just the kind to settle down on the farm and get on with its business without any fuss. As an enthusiast wrote of the Plymouth Rocks of those early days, "they almost vie with the Asiatics in size, the Leghorns in egg production, the Dorkings in quality of flesh, and the Dominiques in hardiness and adaptation to climatic changes."

They were claimed as combining more useful qualities than any other breed then known, and as filling the void between the size and weight of the Asiatic and the European fowls. This may have been overstating their good qualities. Still, it must be remembered—a point of some importance to-day—that experienced breeders in our country took it up primarily with an eye to utility. In it they found that which produced compact table fowls with small bone—though yellow-skinned—and dependable laying qualities. It was certainly a good all-round breed when I first knew it.

General Characteristics. The Plymouth Rock belongs to the general-purpose and sitting class. In make-up it is large compared with European breeds but not as large as the Asiatics. According to the English Standard, however, its weight brings the breed on a level with the Brahma but not up to that of the Cochin or the Dorking.

The cock's body is broad, moderately deep, of medium length, well rounded at the sides, and nicely poised on well-rounded legs. His breast is full and round, having sufficient depth to indicate table qualities, while his back is broad at the shoulders and apparently flat, but with abundant saddle furnishing of medium length. His wings should be closely folded, their bows covered by the breast feathers and their tips by the saddle-hackle. His tail, inclined to be small, is fitted with short and well-curved sickles, and rises slightly from the saddle without forming any apparent angle with the back. The coverts should be abundant enough almost to cover the stiff feathers of the tail.

As regard head points, the skull is broad and full and fairly large—a mean head is not desirable—and the beak is short and stout. The eyes are large, prominent, and intelligent, the ear-lobes oblong and small, and the wattles long and well rounded off, both they and the lobes being of fine texture. The standard description of the comb is "single, medium size, straight and erect, with well-defined serrations, free from side sprigs." In my opinion, however, this does not go far enough to describe the true comb. This part of the bird should be distinctive. Just as the ideal Wyandotte comb has been referred to as resembling the shape of an inverted cradle rocker—the top outline, when viewed from the side—so the Plymouth Rock's comb should have a semi-oval appearance on its top. Moreover, the lower part of the blade at the back should follow without touching the line of the skull. This type of comb on a Rock cock appeals to me much more than the straight out and "fly-away" stamp. Granted the whole of the head counts for a

FIG. 174. A BARRED PLYMOUTH ROCK COCK

mere 5 per cent in the standard scale of points. But this semi-oval kind of comb gives the bird a more finished and imposing appearance.

To continue with the general characteristics, however, the neck should be of medium length and profusely covered with feathers which flow over the shoulders with no apparent break at the juncture of neck and back. The legs must be of medium length, neither stilty like those of the Modern Game nor as short as the Orpington's, yet strong enough to carry a good weight. The shanks, smooth and free of feather or fluff, should be set well apart at the knees, and the toes (four) be straight and well spread. The carriage is upright and sedate, but withal smart and not sluggish in movement. The standard weights are as follows: Cock 10 lb. to 12 lb., cockerel 8 lb. to 10 lb., and hen 7 lb. to 8 lb. In my opinion the minimum

weight in cockerels and hens is about 1 lb. too heavy for utility.

Varieties, Colour, and Markings. There are now eight varieties, viz. Barred, Black, Blue, Buff, Columbian, Golden-Barred, Partridge, and White, but only five of them are officially standardized by the Poultry Club. The ground colour of the Barred is white of a blue tinge, each feather being barred across—almost like the markings of the Pencilled Hamburgh—with

FIG. 175. A BARRED PLYMOUTH ROCK HEN

black, having a beetle-green sheen. At one time these colours were described, respectively, as greyish-white and bluish-black; but the plumage on the whole should have a blue appearance, and be of uniform colour. The bars or bands should be moderately narrow, and of equal breadth to the ground colour, with the marking sharp and distinct; that is, the colours should be clearly defined, and not shaded into each other. In the ideal show specimen the barring not only continues through the shaft of the feather, but it goes into the fluff and undercolour, while each feather finishes with a black tip.

Perfection of colour and fineness of barring have been such a craze with fanciers of recent years that the Barred Plymouth Rock has undoubtedly lost much of the desired standard shape; and to-day the finest barred birds are seldom the most typical for general characteristics. To those poultry specialists who are familiar with show breeds, the Plymouth Rock has its own distinctive shape. It has been said that this breed is most nearly approached by the Wyandotte in type. It is, however, of heavier build, and, moreover, not as cobby as the latter.

The Black Plymouth Rock is of the beetle-green sheen of colouring, while the Blue is devoid of marking (barring), and the Buff is of a rich golden shade, though nearer the light yellow than the red buff of the Orpington. The Columbian and the Partridge follow the colour and markings of the Light Brahma and the Partridge Cochin, which breeds are dealt with earlier in this chapter. The Golden-Barred should have rich buff or chestnut barring on white ground; but very few of this variety have been seen. In all varieties of the Plymouth Rock the beak, legs, and feet are bright yellow, the eyes bright red or rich bay, and the comb, face, ear-lobes, and wattles bright red.

Utility Properties. The breed in its early days was said to be "beyond all question, the best general fowl of all the breeds before the public, producing a large amount of good meat when on the table, and having a large laying capacity." It was also said that experienced breeders saw in this fowl a massive frame, robust constitution, well-balanced organism, good flesh, splendid laying qualities, prepotent powers, great individuality, noble carriage, sound plumage, invincible colour, remarkable hardiness, and domestic habits that required only skilful cultivation to make it the most popular and desirable of breeds. That much was written of it when the first book devoted to the breed was published in England over forty years ago. All of it may have been true, even though it may strike the poultry specialist of to-day as somewhat exaggerated.

Without doubt, the Plymouth Rock should rank high in the general-purpose class. Unfortunately, however, it does not hold that position now. There are, admittedly, strains of it which are equal to the best, particularly in the Barred and the Buff varieties. Both of these colours have given us layers which have put up splendid records in public competition. I have had Blacks as well as Whites which have proved in every way satisfactory for laying and table. The more recent varieties, too, the Columbian and the Partridge, will undoubtedly give good results for utility. So, those who care to take the breed in hand again have something on which to commence.

The birds are extremely hardy, and can stand up to the weather, severe changes having little effect on them. They are good foragers on the farm, yet they bear confinement well, and are contented under varying conditions and surroundings. Hens and pullets are steady layers of tinted-shelled eggs, close sitters and careful mothers. The chickens are easy to rear, and they mature rapidly for a large breed. As table fowls they give satisfaction, for, while their skin and

shanks are yellow, they are compact, and put on flesh kindly. They can stand fattening.

For Sex Linkage. The Barred hen is ideal for mating with any breed of black male bird. But what is not so well known is that she gives perfectly straightforward sex linkage when mated with a Welsummer cock. In this direction it may be noted that, as the black in the Barred Rock is dominant to the brown of the Welsummer, all the pullets are full blacks in down, while all the cockerels show the light head spot. Professor Punnett first drew my attention to this link, and, as he said, since the eggs of the Rock are tinted, these sex-linked pullets should lay rich brown eggs, very similar to those produced by the sex-linked Welsummer-Sussex pullets. The Buff Rock cock is also useful for sex linkage as a gold, to mate with silver hens such as the Light Sussex and Columbian Wyandotte. But other varieties of this breed can scarcely be of service for the purpose.

Standard Requirements. In the Barred variety of the Plymouth Rock the three most important points for exhibition are type, colour, and barring, each getting 20 per cent. As a rule, however, barring counts for more than colouring, because, unless the show bird is finely and evenly marked, it stands little chance in keen competition. On the other hand, uniformity of colour—the hackles, wing bows and tail corresponding with the other parts of the body, and the whole presenting a blue appearance—and density of black are of importance. The birds to avoid are those with broad and open barring, and with faded or almost brown bars, as the black should have a beetle-green sheen. In my opinion type is not studied to the extent it should be; and if the allowance for it were increased to 30 per cent, with the present percentages for colour and barring, it would improve matters in this direction. The balance of the 100 points for the Barred variety is made up by 10 per cent each for size, condition, and legs (and feet), and 5 per cent each for head and tail. But, as I have already remarked, the head of the Plymouth Rock, or rather the comb, is a distinguishing feature, and at least 10 per cent should be allowed for it, the tail then being included in markings. For other varieties of the breed, the points are divided into type and colour 30 per cent each, and head, legs (and feet), condition and size 10 per cent each.

The Poland (Non-sitter)

It is impossible to trace, with any degree of certainty, the origin of this race of fowl; but several theories have been advanced in connexion with it. Some authorities assert that the Poland originated in the country bearing that name, although, as the breed was at one time known as the Paduan, other writers declare that the race came from Padua in Italy. It is more than likely, however, that the name was given to the birds on account of the peculiar formation of the head; and the statement in "The Poultry Book"—to which reference has already been made—that "the singular elevation of the skull gives scientific exactness to the derivation of the term 'poll,' and the deduction hence is easy," appears to me to be the most feasible. However, be its origin what it may, the Poland is essentially a Fancy breed, bred almost solely for its beautiful points; and I question if anyone in England would think of keeping the breed as a commercial proposition, either for the number of eggs it produces or for the quantity or quality of its flesh as a market chicken.

General Characteristics. The Polish fowl belongs to the light and non-sitting class. Some authorities assert that one of the chief characteristics of the breed is the absence of comb and wattles, and that, in a thorough-bred bird, there should be no trace of flesh on the head, the skull being adorned with a crest, and the face with feathers, which are commonly called whiskers and beard. Others, however, declare that, in front of the crest, there should be a small "horn" comb—as described in connexion with the Creve-Cœur fowl—that the face should not be muffled but exposed and fleshy, and that there should be the usual wattles of the fowl. As a matter of fact, the white-crested varieties are so adorned, but the whole of the others must be muffled.

The body of the Polish fowl is fairly long, the breast full and round, the back flat, the tail full and carried well back; and the wings are large and closely tucked to the sides. The head is of medium size but with a decidedly pronounced protuberance on top, and completely covered with a large crest, very similar in formation to the crest of the Houdan. The bird's beak is of medium length, but it has large nostrils rising above the curved line of the beak. In the unbearded varieties the comb is of the horn type and very small, the face is smooth and the wattles are rather large and pendant; in the others the muffling is large, full, and compact, fitting around the back of the eyes and almost covering the face. The ear-lobes are very small and round, but quite invisible in the muffled varieties; the eyes are large and prominent. Neither the muffling nor the crest must be so profuse as to prevent the fowl having full use of its eyes. The neck is long, and abundantly furnished with hackle feathers which finish well over the bird's shoulders. The legs are slender and moderately long without being stilted; the shanks are free of feathers, and the toes (four) slender and well spread. The carriage is erect and sprightly. Matured cocks average 6 lb., and hens 5 lb.

Varieties, Colour, and Markings. There are several varieties of the Poland, among which may be mentioned Chamois, Gold, and Silver (all laced), the Cuckoo, the Grey or Grizzled, the Speckled, the Spangled, the Blue, the Black, the White, and the Ermine; but only six of them are dealt with in the Poultry Club Standard, and they are the Black, the Blue, the Chamois, the Gold, the Silver and the White.

The Chamois is a Buff with markings, most of the feathers having centres of a soft buff colour with the borders of a very light shade of that colour, or white. The cock's crest is white at the roots and tips, and as free as possible from whole white feathers; his muffling is mottled or laced, not solid buff, and his hackle is tipped, while his wing bar and secondaries are laced and the primaries tipped, and his tail, sickles and coverts laced. Except that the hen's wing primaries are tipped, her colour and markings (including the crest) are buff, and laced. The Gold cock is golden bay with black markings. The cock's crest is black at the roots and tips, and free of white feathers; muffling mottled or laced, not solid black; hackle tipped; back and saddle distinctly laced or spangled at the tips; breast, thighs, shoulders and wings laced, except primaries, which are tipped; and tail laced, the ends of the sickles well splashed—all mottling, lacing, tipping, and spangling being black. The hen is golden bay with black lacing, each feather being distinctly marked, and as free as possible from splashes. The Silver is similarly marked to the Gold, in both sexes, but the ground colour is white or silver instead of golden bay.

The Black is rich metallic black with snow-white crest, and a white crest adorns the Blue, which variety may be of one shade of blue (self-coloured) or laced as in the Andalusian. The White is pure white with a black crest; the Speckled is black and white like the Houdan, the Cuckoo similar to the Dorking, the Grey and the Spangled (yellow) like Old English Game of those colours, and the Ermine somewhat similar to the Light Brahma, except that the hackle and tail feathers have black splashes or spots at the end instead of being striped or laced. Beyond the Black and the Blue, these latter-mentioned varieties are rarely seen in England. In all of them, however, the beak may be dark blue or horn; the eyes are red, the comb and face (in the unbearded kinds) red, the ear-lobes blue-white, and the legs and feet dark blue.

Utility Properties. Of course, like every other purely "fancy" breed, the Polish fowl has its utility properties. Granted they may not be worth much, commercially, but the females are summer layers of good-sized white-shelled eggs; and they are practically non-sitters, as they rarely exhibit signs of broodiness. It is generally supposed that the chickens are difficult to rear; but if ordinary common sense be exercised in their management, they will not give much trouble. It is when their crests are half-grown that most care has to be bestowed on the birds. As regards their table qualities, the flesh of the Poland resembles that of pheasant. The breed is eminently suited for a confined space; in fact, a small dry place answers better for them than does an unlimited range, because the crest of the fowl can then be kept in good condition, whereas in a natural state it is apt to be small and become ragged.

Standard Requirements. The head-piece is the most important part of the Polish fowl for exhibition purposes, and it gets 45 per cent, no less than 30 per cent being allowed for the crest. Colour comes next, with 30 per cent in the white-crested varieties and 25 per cent in the others. In the former, condition ranks as 15 per cent and type and size as 5 per cent each, but in the latter, these three points get 10 per cent each. A split or a twisted crest is a serious defect in any variety, so is a comb, when allowed, of any other than the horn type, while absence of muffling in the Chamois, Gold, Silver and White would keep a bird out of the prize list.

The Redcap (Non-sitter)

It is somewhat surprising that the Redcap is not among our popular breeds, because, although it is undoubtedly one of the oldest we possess, it is a good layer. Very little appears to be known about its origin, but the consensus of opinion is that it was bred from the Golden-Spangled Hamburgh. Very likely it was the result of crossing this variety of the Hamburgh with the Black-Red Old English Game fowl. In some parts of the country the breed is known as the Derbyshire Redcap, Yorkshire Redcap, Old English Redcap, Crammer, Moss Pheasant, Pheasant Fowl, and so forth. Years ago Yorkshire used to be noted for the breed, and classes were provided for it at many of the shows; but when the Hamburgh gained such a footing in that county the Redcap was much neglected, and the best, nowadays, are found in Derbyshire.

General Characteristics. Although classed as a non-sitter, the Redcap is a medium weight rather than a light breed. In general characteristics it is very similar to the Old English Pheasant Fowl; but while it has a rose type of comb, the comb is very large. The male bird's may measure 3 in. to 4 in. across and be 5 in. long to the end of the spike, while the hen's comb is about 2 in. broad. In any case, the comb must be so firm that it does not fall over either side of the face or hang too much in front; it should be carried well off the beak and the eyes. The top of it

must be full of fine spikes, be free from any hollowness in the centre and set straight on the head. It should finish with a straight leader, neither inclined upwards nor following the curve of the neck. Cocks weigh about 7 lb. and hens 5 lb.

Variety, Colour, and Markings. There is only one variety of Redcap, and it may be described as a Black-Red. Each feather of the cock's neck-hackle and saddle has a red quill with green-black centre of webbing, fringed with dark red. The back is dark red, spangled or tipped with black, and the wings are also of the former colour with a black bar across them, the remainder of his plumage being black. The hen's neck-hackle is similar to that of the cock, but her ground colour is deep nut brown (free from smuttiness), each feather marked with black half-moon shaped spangles, except the tail, which is black. The beak is horn coloured; the eyes are red; the comb, face, ear-lobes and wattles are bright red, and the legs and feet lead coloured.

Utility Properties. The Redcap is primarily a layer, and in this respect it is very near the top. The hens are non-sitters, and their eggs are white-shelled. Well-developed pullets produce good-sized eggs, and, if spring-hatched, they will lay well in winter. The chickens are easily reared, and may safely be hatched in late winter; in fact, they grow better in the earlier months of the year than when the weather is hot. In hardiness, this breed is almost equal to the Old Game fowl, while it is little inferior to that bird for table purposes, the body being plump and carrying a good amount of meat with very little offal, while the flavour of it reminds one of game. Being of a very active disposition, the fowls require a wide range, since in small quarters they are apt to mope and lose that bright lively look which is one of the beauties of the breed.

Standard Requirements. As might be expected, the head is the chief part of the bird for show purposes, and in the scale of points 45 per cent is allowed for it, of which 25 per cent is given for the comb. Colour and markings rank next with 25 per cent; then follow type and size combined at 15 per cent, and condition, tail, and legs (and feet) 5 per cent each. It is a serious defect for the comb to droop over either side of the face or for the birds to have other than lead-coloured legs.

The Rhode Island Red (Sitter)

In an old edition of the "American Standard of Perfection" it is stated that "The Rhode Island Reds . . . are believed to have originated in crosses of the Asiatics, Mediterraneans and Games," which, to say the very least of such a statement, is delightfully vague. The Rhode Island Red is of American production, and it was first bred in Rhode Island, the smallest state in the North American Republic. It is evident that, just as poultry-keepers of the south-eastern counties of England bred solely for utility properties in the old days, with breed characteristics to the fore but colour a very secondary consideration—and from one particular type evolved the Sussex—so poultrymen of Rhode Island bred more or less red-plumaged fowls in large numbers for practical purposes, and subsequently named their breed after that state. Less than thirty years back, when the Red began to be exhibited at fanciers' shows in the land of its birth, people were apt to consider it as a new breed. Nevertheless, like our own Sussex, it appears to have been in existence for a considerable period prior to its advent in the show pen.

Writing in 1906, the late Dr. Aldrich—than whom no one did more to popularize the Red in America in its early days—said that the utility farmers of that section of Rhode Island known as Little Compton had, for nearly sixty years, "been selecting red males and leaving the females to be what they may. By this means they had carefully bred this now famous breed." Another American writer on the same subject remarked that what struck him very forcibly was that red cocks were numerous in 1850, while at the time of the first Boston, Mass., Show, in 1849, there were red fowls of such breeds as Shanghais, Cochin Chinas, Plymouth Rocks, Malays, and Chittagongs.

One of our own authorities has said that several breeds played a part in the composition of the Rhode Island Red as it exists to-day, and that the Buff Cochin, the Red Malay, and the Brown Leghorn, each paid its tribute. There were probably others, but on this point there is no definite information. Beyond the Malay, which is a Game fowl of sorts, although not considered so to-day by many fanciers, I cannot trace any reference to the true Game bird as having been used in the make-up of the Rhode Island Red. However, I do know that many of the old-time Red Dorkings—now almost extinct in England—were exported to Rhode Island in my young days, while of recent years the Red Sussex has been blended into some strains of Rhodes in this country.

General Characteristics. The breed belongs to the general-purpose class, and on the heavy rather than the light side. One of its chief characteristics is oblong shape; and according to the standard set up by the Rhode Island Red Club of the British Empire, the body should have an oblong look—deep, broad, and long, with a long and straight keel-bone extending well forward and back. The breast must be broad and deep, carried in a line almost perpendicular to the base of the beak, and not in front of that line; and the back broad and long, and nearly horizontal. This

latter effect is modified in the male bird by slightly rising curves at the hackle and lesser tail coverts. The back of the immature pullet is naturally not as broad as that of the completely matured hen; that is, in comparison with the length of the pullet's body, her back looks somewhat narrow.

The head, of medium size, is fitted with a neat single comb (upright and straight), or a small oval-topped rose comb (similar to that of the Wyandotte),

Fig. 176. A Rhode Island Red Cockerel

but with a small spike at the rear. The wattles and ear-lobes are fairly well developed, while the neck is of medium length and covered with closely-fitting hackle feathers. The wings are large and closely folded. The legs are of medium length with well-rounded shanks free from feather, and strong toes (four) well spread. The tail is of medium length, the cock's being carried well out behind to give extra length to the bird, while the hen's should form no apparent angle with the back, neither must it be met by a high rising cushion.

For too long, unfortunately, colour has been a fetish with fanciers, and type a very secondary consideration. And yet, those of us who do know something of breeding the so-called self-colour varieties—such as black, blue, buff, and red—are aware of the great difficulty of keeping an ideal standard shape with perfection of colour. However, the Rhode Island Red being essentially a utility breed, robustness of constitution is of more importance than absolute evenness of surface colour and brilliance of lustre. Standard shape, which ensures vigour, must be the very first consideration. The carriage of the Rhode Island Red is alert, active and well balanced. The plumage is abundant, but the whole feathering is close rather than loose, that of a robust fowl. The standard weights are 8½ lb. cock, and 6½ lb. hen, but a pound less in each would be ample.

Variety, Colour, and Markings. As its name denotes there is only one variety, viz. Red, but single-combed as well as rose-combed. The former was the first out, and for some years it conformed to the standard much more than did the rose comb, which very often followed the Wyandotte in form and size. The single comb was admitted to the American Standard of Perfection in 1904; the rose comb got official recognition in 1905 as the "Red American," and not until 1906 did the American Poultry Association standardize it as the rose-combed Rhode Island Red.

With the exception of the tail, which, including the sickles, is black with a beetle-green sheen, the general surface colour of the cock is rich brilliant red. That of the hen is a rich, even shade of dark red, although not of as brilliant a lustre as the male bird. In the female also, the tips of the lower hackle feathers have very slight black ticking but not heavy lacing, while her tail, of course, is black. In both sexes black is allowed in flights and secondaries. The chief thing, even in the cock, is to have as little contrast as possible between any parts of the surface; and there must be no shaftiness, mealiness, peppering, or brassy effect. The undercolour—seen when the plumage is lifted—and the quill of the feather should be red or salmon, and not black, white, smoke, or a smut shade; and this is so important that, when judging for colour, "other things being equal, the specimen having the richest undercolour shall receive the award." In both sexes the beak and legs may be red-horn or yellow, yellow being preferred for the legs. The eyes are red, and the comb, face, ear-lobes, and wattles brilliant red.

Utility Properties. In utility properties the Rhode Island Red scores well; but the broody tendency of some pullets, and the colour difficulty, have made many folk take to other breeds, even when keeping utility stock only. To a large extent, though, broodiness is a question of feeding and management; and when poultry-keepers have complained to me on this point I have always told them so, and suggested a revision of the diet. I think it will be acknowledged, however, that Reds are apt to lose their colour after their first moult. Males retain it much better than

females, but as a rule in both sexes it becomes light and uneven with age. Still, neither that nor broodiness deters me from keeping Rhodes.

The breed is a decidedly hardy one, docile, and a good forager. The chickens grow well and mature early, the cockerels being ready for the table at three to four months. They make fleshy birds for market, although their yellow skin and legs are against them for the very top trade. Still, one can invariably sell them profitably for table.

The pullets can be got into lay at six months; and at that age they are sufficiently developed to produce good-sized eggs, those of standard weight. They lay rich brown-shelled eggs; and when allowed to sit they make excellent mothers. The pullets are great winter layers, and have given a very good account of themselves at laying tests. When the utility poultry-keeper can master breed characteristics and avoid buff plumage and white legs he will have a truly great fowl.

Sex Linkage. The Red being in the gold class, the males respond well with any variety of silver female. One of the most popular links is the Rhode Island Red cockerel with Light Sussex hens. This union produces cockerels whose plumage is generally of a cream tint, and pullets of a dark shade of buff at the day-old stage. The former can be developed into good table fowls, since not only have they the appearance of Sussex, but they can stand special feeding for market. They grow at a good pace.

Another link with the Red, but the reverse way, is to mate a White Leghorn male with Rhode hens. This way of breeding produces, in the main, buff or gold cockerels and white or cream pullets. But it is not one which the beginner can use with the same degree of certainty as the orthodox gold with silver. The pullets of this reverse link breed true to colour, but some of the cockerels do not, and are white except for a few brown feathers on their backs. However, even those cockerels make suitable table fowls for the ordinary market, while the pullets closely resemble the White Leghorn in shape; and they furnish up early, lay well, and produce tinted-shelled eggs.

Standard Requirements. Although it may not appear to be so from a casual glance at the scale of points for judging, the chief parts of the Rhode Island Red for exhibition purposes are its head and general colour, each of which gets 20 per cent, the former being made up of "head and comb" 10 and eye colour 10. Admittedly "shape, size, carriage, and symmetry" are lumped together and given 30 per cent; but here we have three distinct sections—symmetry and shape are synonymous in show circles—and there is nothing to indicate what proportion should be allowed to each, as, for example, how many points a symmetrical specimen should lose because it is of small size and well under standard weight. Quality and general texture—presumably of the plumage, skin, fleshy parts of the head, and bone—account for 15 per cent, condition for 10 per cent, and legs for 5 per cent. There must be nothing coarse about the bird, but, equally so, there must not be anything over-fine, because both coarseness and superfineness are accounted as serious defects in show stock.

Despite what may be said to the contrary, colour is, unquestionably, the most important point for which to breed. And, because of it, there is a special note in the Standard issued by the Rhode Island Red Club to the effect that "no award shall be made at any show to any exhibit the top or undercolour of which shall be, in part, removable on the application of clean calico moistened in any chemical." A rich chestnut-red, with a lustre so brilliant as to have a glossed appearance, a "live" colour, is what is desired, as it does not have the "washed out" look of a lemon-buff, or the muddy and dead appearance of a very dark chocolate-red. This can be obtained without having recourse to artificial means beyond the usual and legitimate method of preparing birds for exhibition. There is certainly no necessity to use oil for the purpose of "improving" the gloss, or to wash a Red with certain soaps which will intensify the colour. Washing the plumage, as a matter of fact, should not be countenanced; and the specialist club has instructed club judges to "pass" any exhibit which, in their opinion, has been "over-prepared" for show.

The Scots Dumpy (Sitter)

This quaint bird, with the waddle of the duck rather than the strut of the fowl, is a very old breed of Scottish origin. Some authorities declare it to be the oldest of all the breeds of Scotland; and they state that it was in existence long before the Scots Grey was thought of, which certainly stamps it as of fairly ancient lineage. For many years it remained in obscurity in the northern parts of Scotland and the Western Islands; and for long its home was the Island of Arran, where the people preserved the breed with many of its original colourings. In some of the Highland glens to-day there are flocks of fowls of undoubted Dumpy parentage; they may not be quite so long-backed or so short-legged as the birds which are seen at poultry shows, but they have the true Dumpy gait or waddle. This duck-like waddle is a characteristic of the breed that should be intensified to a greater extent than it is to-day; and unless the birds waddle when walking they are not true to the breed. It is well known that a great deal of crossing has been resorted to in the endeavour to increase size

and improve the colour; but in some instances type has been sacrificed. At any rate, while nothing was to be gained by continuing with the round back and squirrel tail so common in the original Dumpy, the breed's peculiar characteristic should not be lost sight of; hence more attention should be paid to carriage.

General Characteristics. According to the Poultry Club Standard for the breed, the cock's body is mentioned as being square, but it is nearer oblong, and somewhat like the Dorking in most points. The breast is deep, the back broad and flat, the wings of medium length and well tucked up, and the tail full and flowing. The legs are very short, the shanks not exceeding 1½ in., and the toes (four) well spread. The bird's comb may be single or rose, but the former is preferred. The carriage should be almost horizontal; many Dumpy cocks carry their bodies at too high an angle, which makes them appear defective in front. Standard weights are 7 lb. for the cock, and 6 lb. for the hen.

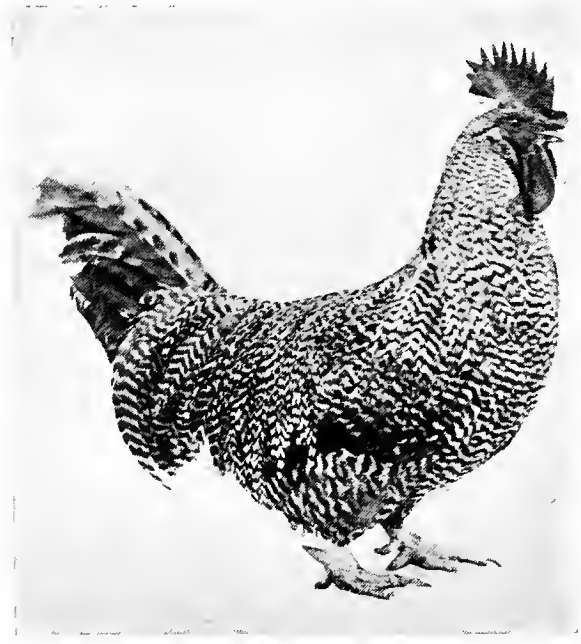


FIG. 177. A CUCKOO SCOTS DUMPY COCK

Varieties, Colour, and Markings. Although the varieties chiefly exhibited are the Black, Cuckoo, Dark, and Silver-Grey (these latter three being similar to Dorkings of those kinds), there are several others, such as Golden-Hackled and Silver-Hackled Blacks, Blue, Buff, Brassy-Hackled Grey, Gold, Spangled, and White. In all varieties the eyes should be red and the comb, face, ear-lobes and wattles bright red; the beak and legs are white, except in the Black (black or slate) and in the Cuckoo (mottled).

Utility Properties. The Dumpy is a table fowl, pure and simple, and has no superior in fineness of flesh and flavour. The pullets are not of much account as layers, but they produce tinted eggs. The breed is a hardy one, and the chickens are easy to rear.

Standard Requirements. Type is the strong point in exhibition Dumpies, and 40 per cent is allowed for it. Size comes next with 20 per cent, then head and condition with 15 per cent each, and colour 10 per cent. Type includes low and heavy body, horizontal carriage, short legs and a waddling gait. The breed is also known as short-legged Bakies, Crawlers, and Kitties.

The Scots Grey (Non-sitter)

Like the Dumpy, the Grey is claimed to be a purely Scottish breed. There are those who say that it is descended from "the old British Game fowl," and that it can be traced back as a domestic fowl for hundreds of years. It has been bred as a pure race for at least 150 years, the early characteristics being erect carriage, level markings, red ear-lobes, and long white or mottled legs. The birds may have descended from the old Game fowl of Great Britain, or even from Irish Game, but they resemble the old stamp of Dominique more than Game, although the Grey has a single comb instead of a rose comb, and its legs (unlike those of the American breed, which are yellow) are white, spotted, or mottled with black. Certainly, Scots Greys are much appreciated in Scotland, large classes of them being seen at some of the Scottish shows, while they were great favourites on farms in the south of Perthshire and Stirlingshire—where they were known by the name of "Chickmalins"—as layers. The breed has also been referred to as the Scottish Dorking; but it is of light build in comparison and of more sprightly contour, with something of the old-fashioned Game style about it, and it is minus the fifth toe of the English bird. It has been suggested that the Scots Grey originated from a Game cross with the Cuckoo Dorking, whose barred plumage it has inherited; but this is questionable.

General Characteristics. The breed is a non-sitter, but it is on the heavy side. The body is compact and fairly long, the back broad and flat, and the breast deep and full. The wings are moderately long, and closely carried, the bow and the tip being covered by the neck-hackle and saddle-hangers. The tail is fairly long, carried well up—but not like a squirrel's—and has full sickles. The head is fine and intelligent, and the comb (single) is somewhat small, the back of it following the line of the skull. The neck is finely tapered and covered with profuse hackle feathers

which flow on the back and shoulders. The legs are long and strong, the thighs distinct but not as prominent as those of the Game, while the shanks are free of feathers, and the toes (four) strong and well spread. The carriage is erect, active and bold, and the birds are firm when taken in hand, somewhat similar to the Game fowl. Cocks weigh about 9 lb., and hens 7 lb.

Variety, Colour, and Markings. There is only one

FIG. 178. A SCOTS GREY COCKEREL

variety of Scots Grey, and that is the Cuckoo; at any rate the breed is cuckoo-feathered. The ground colour is blue-white, and the barring is black with a metallic lustre; and the markings—except on the neck-hackle, saddle, and tail, where they are slightly angled or V-shaped—run straight across the feathers, the alternating bands of black and white being of equal width, fine rather than coarse, and sharply defined. The beak may be white or white streaked with black, and the legs and feet white or white mottled with black, but not dusky. The eyes are amber and the comb, face, ear-lobes, and wattles bright red.

Utility Properties. The breed is a very good all-round one for utility, that is, the females are dependable layers of large eggs of a pale cream shade, and the cockerels make good market birds, the flesh being of fine texture and plentiful on the breast. The Scots Grey is hardy to a degree, and will grow and thrive in high and exposed districts, while the chickens are easy to rear.

Standard Requirements. Colour and markings are the chief points to aim for in exhibition specimens since, combined, they amount to 50 per cent. Size follows with 15 per cent, then type, head and condition 10 per cent each, and legs and feet 5 per cent. It is a great thing to have the bird "read" well throughout; that is, the shade should be the same from head to tail, and the markings, all over, small, even, and sharply defined. The plumage should be free of red, black, white, or yellow feathers, or any brassy or yellow shade. The tail should be evenly and distinctly barred, but the markings V-shaped and not straight across.

The Sicilians (Non-sitters)

Although two breeds are standardized by the Poultry Club as Sicilians, viz. Buttercups and Flowerbirds, it is difficult to see wherein they differ in general characteristics. Both are claimed to be of Sicilian origin, and they are obviously of the Mediterranean class of fowl. The Buttercup reached England via America—as, of course, did the original Leghorn in years gone by—while the Flowerbird was imported direct to our country from Sicily. The former appears to be an American version of the original type of Sicilian fowl, because there is no evidence that the breed, as the Buttercup, is to be met with in Sicily or upon the Italian mainland. On the other hand, the cup-shaped comb is not altogether uncommon, and certainly some of the Buttercup varieties are obviously cup-combed Leghorns.

It is said that "the Buttercups were taken to America from their native island some sixty years ago, being picked up at the port of Palermo for consumption. On the voyage the birds laid such a quantity of eggs that their lives were saved and they were landed in America. There they thrived apace and eventually came over to England, since which time we have had numerous importations, some from the States and some from Sicily. But the Sicilians were not so careful in keeping their stock pure and correct in marking as the Americans." As far as I recollect, the Sicilian fowl was not imported to England from America until 1911, and it was by no means what might be termed a finished article then—it wanted improving. However, as the two breeds are identical, there is no need to deal with each separately.

General Characteristics. The Sicilian is a non-sitting breed and of a comparatively small and light build. The cock's body is of medium length and depth, the breast carried forward and at the slope, and the back is broad and straight but sloping downwards to

the saddle and rising with a slight concave outline to the tail. The wings are large and well clipped up; and the tail is fairly large and carried well up and out. The head is of medium size; the eyes are full and alert, the ear-lobes almond-shaped, flat and smooth, and the wattles thin and well rounded. The comb is cup-shaped; it begins as a single comb at the base of the beak and then joins a cup-shaped crown, set firmly on the centre of the skull and surmounted with well-defined and regular points. It is of medium size and fine texture, and should be free of internal growth, that is, without any spikes in the cavity or centre, or what would be the bottom of the cup. This cup comb is supposed to be joined all round, but more often than not there is an opening at the back of it. The cock's neck is rather long and his hackle feathers flow well over his shoulders. His legs are slender and of moderate length, the shanks free of feathers, and the toes (four) straight and spreading. The bird's carriage is bold, upright, and active. The standard weights are as follows: Buttercup cock 6½ lb., cockerel and hen 5½ lb., pullet 4 lb.; Flowerbird cock 4 lb. to 4½ lb., hen 3½ lb. to 4 lb.

Varieties, Colour, and Markings. The standard varieties of the Buttercup are Brown, Golden, Golden Duckwing, Silver, and White, and of the Flowerbird Mahogany and Spangled. The Brown and the Duckwing are similar in colour and markings to the Leghorn of these varieties; while there is no need to describe the White beyond saying that the plumage is pure white throughout. The neck-hackle, back, saddle, shoulders and wing bows of the Golden cock are bright orange-red, the rest of his wing, and his breast, red-bay. His body is light bay (at the stern), and there are black spangles on some of the body fluff, while the tail is black with red-bay at the base of the sickles, and an edging of that colour on the coverts.

The hen to match has a lustrous golden buff neck-hackle, light golden buff breast and thighs, with black spangles from the middle of the breast downwards. Her back is golden buff, regularly spangled with black and extending over the entire surface, including the cushion and the coverts. Her tail is dull black, but the two highest feathers are mottled with buff. Her wing bow and bar are golden buff with parallel rows of elongated black spangles, each spangle extending slightly across the web; the quill and edge of the feathers are golden buff, the primaries black edged with buff, and the secondaries golden buff regularly barred with black on the outer web but black on the inner. Except that the ground colour of the Silver (Buttercup) is silver-white instead of red or bay, this variety is similar to the Golden.

The Mahogany (Flowerbird) is almost identical in colour and markings, both male and female, to the Brown Buttercup. The cock's hackles are rich mahogany instead of rich orange-red; his breast and underparts are blue-black instead of glossy black; and his back, shoulders and saddle, and wing bows are deep cherry-red instead of deep crimson-red; but in other respects they are the same. The only difference between the females is that the Mahogany hen's neck-hackle is "gold or golden brown" instead of "golden yellow," each being striped with black. In breast colouring and the colour and markings (pencilling) of the body they are alike. The Spangled is the Mahogany marked with white, the cock's neck-hackle being lightly spangled (with white), his breast and underparts evenly spangled, his back, saddle, shoulder-coverts and wing bow "sprinkled," each feather of his wing bar tipped, and his tail also marked with tips. The hen should be evenly spangled all through, and her tail tipped with white. In both kinds of the Sicilian fowl the beak is dark horn lightly shaded with yellow; the eyes are red-bay, the comb, face, ear-lobes, and wattles bright red, and the legs and feet willow-green or slate-green.

Utility Properties. Whether the Sicilian fowl be called Buttercup or Flowerbird it is purely and simply a layer, a prolific producer of white eggs. The breed is a remarkably hardy one, and the chickens are easy to rear. The cockerels might come in handy for the small table chicken trade, as they are plump little birds and small-boned. I question, however, if anyone would keep the breed in large enough numbers even to cater for the 2½ lb. chicken trade.

Standard Requirements. In the Brown (Buttercup) the chief point of the show bird is its head, with 29 per cent, of which 15 per cent is allowed for the comb; but spikes more than a quarter of an inch long in the cup or cavity of the cock's comb, or any indication of spikes in that part of the hen's comb, are serious defects. Colour (and, of course, markings as well) counts up to 25 per cent, while neck-hackle, size, type and condition get 10 per cent each, and legs and feet 6 per cent. In other varieties (of the Buttercup) colour is the most important in the scale of points, getting 44 per cent, while type gets 30 per cent, comb 14 per cent, and symmetry, size and condition 4 per cent each. It is, admittedly, difficult to get perfection of colour and markings in the Golden and Silver varieties; and yet even the best specimens in these points would scarcely appeal if the comb were in any way faulty, that is, so weak as to fall over or so devoid of character as to be flat-sided and spread out like a saucer rather than a cup.

In the Flowerbirds (Mahogany or the Spangled), colour and markings rank together as 40 per cent while type is allowed 20 per cent, head 17 per cent

(of which the comb gets 15 per cent), condition 10 per cent, legs 7 per cent, and size 6 per cent. In this branch of the Sicilian fowl the serious defects include comb over either side, or V-shaped instead of cup; and a tuft of feathers on the head, although two or three feathers which do not lie flat should not be considered as a tuft. In the Spangled variety it is imperative that the ground colour is of the same shades as those of the Mahogany, in both sexes, and not light, as is sometimes seen in black-red and partridge varieties of fowl, while the markings should be spangles and not splashes, the general effect of evenness rather than the tipping of any particular feather being the point to consider when exhibiting the birds.

The Silkie (Sitter)

The Silkie is of no commercial value, but it is a very charming and unique race of fowl; and its quaintness has earned it considerable popularity in this country during the past fifty to sixty years. It is supposed to be a native of Japan, and in my young days it was always referred to as the "Japanese" Silkie; but while it certainly came from the East I have never heard of anyone who saw the breed in Japan. Just how it was obtained it is impossible to say; but, although there is only one kind acknowledged in England at present, there were and are silky-plumaged fowls of other well-known breeds. For instance, in the early 'fifties, buff and partridge-coloured Silkie Cochins were by no means rare, the latter variety being termed the Emu fowl; and, again, fanciers who have bred Langshans have occasionally had specimens of this breed which sported the silky plumage. However, Silkies are quaint little fowls, and to be appreciated they must be known and kept. It is not a long while since they were imported into England from Eastern Asia, yet they are well established here, and are thoroughly hardy.

General Characteristics. The breed belongs to the Asiatic class and is a general-purpose one, although of a much lighter weight than any non-sitting breed of fowl. The body, though small, is stout-looking. The cock's back is short, owing to the fullness of the neck-hackle and his saddle rising to and blending with his tail, which is short, and ragged at the ends of the true tail feathers, while the sickles do not flow but have a short and round curve. The wings are soft and fluffy at the butts, the ends of the flights being ragged, and "Osprey plumaged"—that is, some strands of the feathers hang loosely downwards—and the ends of the wings are covered by the saddle-hackle, which is soft, abundant, and flowing. The legs are short; the thighs are covered with abundant fluff, which stands out prominently, while the shanks, which are smooth-scaled, have an even line of soft feathering on their outer sides, becoming thick on the outer toe, and showing also on the inner toe. Fashion or fancy has decreed that the Silkie has five toes on each foot, the fourth and fifth diverging from one another.

The head is an important part of this breed of fowl. It has a comb and a crest. The comb is an almost circular cushion of flesh, fairly smooth, but with a slight indentation or furrow transversely across the middle; it is broad rather than long, and finishes with a regular peak behind, although in no way does it approach to the rose comb of the Hamburgh. The hen's comb is quite undeveloped. The crests of both sexes are of moderate size. The cock's crest is as upright as the comb will permit, full and soft (not having any hard feathers) and with half a dozen or more silky feathers streaming gracefully backwards from the lower and back part of the crest, to a length of about 1½ in.

The hen's crest is decidedly round and full, very similar to a powder puff; it stands up and out all round, not inclined backwards or hiding the eyes, or split by the comb. The beak is short and stout and the face smooth; the eyes are brilliant but not too prominent, the ear-lobes more oval than round, the cock's wattles nearly semicircular (not long or pendant) and concave, but absent from the hen or, if present, very small indeed. The bird's neck is short but broad and full at the base, and furnished with abundant and flowing hackle which covers the shoulders and almost joins the tail. The carriage of the Silkie is compact and lively, while its plumage is very silky and fluffy, with a profusion of hair-like feathers. Cocks weigh 3 lb. and hens 2 lb.

Varieties and Colour. So far only three varieties are standardized, and they are all self colours, viz. Black, Blue, and White—black plumage with a green sheen; an even shade of blue, without lacing, barring, or any markings; and snow-white. Buff, Partridge, and other varieties of the Silkie have been exhibited, birds conforming to the above general characteristics, but there are no official standards for them. In all colours of the breed the beak is slate-blue and the skin mulberry. The eyes are brilliant black, the comb, face, and wattles mulberry, the ear-lobes turquoise-blue, the legs and feet lead, and nails blue-white.

Utility Properties. As I have said, Silkies have no commercial value. The hens are good layers in that they will lay at all times of the year; but they do not produce many eggs—perhaps a score or so—before becoming broody, and the eggs (brown-shelled) seldom exceed 2 oz. They certainly excel at brooding, sitting well wherever they are placed and covering eleven to thirteen eggs. In proportion to their size

they possess more warmth than hens of other breeds, and they remain longer with their broods. Silkies are singularly quiet and good-tempered; a lot of cockerels will live amicably together, and the hens are docile to handle while sitting. As mothers they are excellent; they will brood chicks of other breeds and be as gentle with them as if they were their own instead of adopted ones. The hens are in demand by those who

FIG. 179. A WHITE SILKIE COCK

rear bantams, and they have often acted as foster-mothers to pheasants and partridges, because they rarely crush an egg or a chicken. However, one would scarcely specialize in Silkies solely for brooding purposes.

Standard Requirements. The texture of the plumage, and the head points, are the most important parts of the Silkie for exhibition, each getting 30 per cent. Type ranks next with 20 per cent, and then colour and legs, 10 per cent each. Faulty plumaged specimens show stiff feathers or harsh and wiry down; but Silkies should have soft and silky plumage all over, and they should not be "feathered." The cushion should be abundant, the crest full without hiding the eyes, the legs short and almost hidden by the silk on the thighs, and the foot-furnishing soft on the outer and inner toes. Dark mulberry face and comb, and turquoise-blue lobes are very important; and so is the shape of the comb, while the colour of the eyes and beak must not be overlooked.

Type is certainly a strong point, because a tall, leggy, and narrow-bodied bird is an abomination. The legs should be decidedly blue; they sometimes have a green tinge, but that is faulty and it generally goes with green beak and ear-lobes, which are very unsightly. Silkies naturally dislike heavy rain and brilliant sun; and if they are to be exhibited it is advisable not to let them run anywhere. They should never be washed, since it removes the natural bloom of the plumage; so care should be taken to prevent their getting dirty. A well-clipped grass run suits them in fine weather, provided it is shaded; and bedding them on sawdust and chaff will do much to preserve their condition.

The Spanish (Non-sitter)

Whether the White-Faced Black Spanish, to give the breed its full title, was actually produced in Spain, it is hardly possible to state with any degree of certainty; but that it belongs to the Mediterranean group of fowls cannot be doubted, and in this class it appears to stand first and foremost, not for its merits as a useful breed, but for its old celebrity. Very many years ago the variety came to England from Holland, whither, doubtless, it was brought during the rule of Spain in the Low Countries, in the sixteenth century. The Dutch had a peculiar talent and fancy for breeding fowls to a special standard, and in all probability they improved the fancy point of the white face before much attention was given to pedigree breeding in our country.

It is, I believe, in common with the Dorking, one of the oldest established breeds known in England; and, long before many other breeds, such as Cochins and Brahmas, were thought of, it enjoyed a recognized position among breeders of poultry. Unfortunately, however, like so many of the old breeds of domesticated poultry, the Spanish is not now bred to any great extent in this country, although it has a vogue in America. At one time, it flourished amazingly, more particularly in the west of England and around Bristol; and poultry-keepers in those districts had robust birds, which doubtless made the reputation of Spanish hens as layers. It was as egg producers that they were famous; and they well deserved their position, because they were prolific layers of large, smooth-shelled white eggs.

In my opinion, however, far too much importance was attached to the peculiar smoothness and fine quality of the face; hence, while the English birds no doubt excelled in the texture of that point, so the breed, or many strains of it, degenerated in laying

powers. This persistent breeding for that one fancy point for so many years has well-nigh ruined the stamina of the breed; so that, in its present state, the Spanish is scarcely worth its keep for utility purposes. From a purely economic point of view the breed is useless, much as I regret having to say so; and I do not know of anyone to-day who keeps a flock of them, or even a back-garden poultry-keeper who goes in for them to provide his household with eggs.

Forty to fifty years ago the Spanish beat all other breeds for egg production, for longevity, and for juvenilè appearance when advanced in years. I recollect a famous old hen, a bird which won a challenge cup in her pullet year, and had many prizes to her credit, being mistaken in her fifth year for a pullet —and by a fancier of no mean repute. The mother of that hen, I was told, when in her eighth year, averaged four eggs every seven days for months, while another Spanish hen lived fifteen years and laid to the last —in fact, she died on the nest. However, the breed to-day has nothing like that amount of stamina, and few poultry-keepers would specialize in it, even for show purposes.

General Characteristics. The Spanish belongs to the Mediterranean group of fowls, and is a non-sitter. In the size and shape of its body it is very similar to the Minorca, except that its back slants downwards to the tail and its legs are long and slim. The peculiarity of this bird is its head. The cock's skull is long, broad and deep. His eyes should be full and wide open, and his comb single, erect and straight from front to back, fairly large and finely arched, the under edge which overhangs the hackle feathers following closely the contour of the neck and not forming a large angle with it. His face is long and deep, as large as possible—a good face will measure from 6 in. to 7 in. in length—and of very smooth texture. It should begin at the beak, extend well back behind the ears, rise well over the eyes, and at the top be separated from the base of the comb by only a narrow arched fringe of feathers, while on each side of the neck it should terminate with a broad graceful curve, lying well back and flat; not falling in long pointed folds.

The ear-lobes are deep and broad; they extend well below the wattles and are connected by a broad front—the bib—and the broader the bib the better, provided it is of fine texture and free from folds or creases. Making due allowance for difference in sex and functions, the shape and general characteristics of the Spanish hen do not differ widely from those of the cock. Her comb should fall over one side of her face, and her face should be short but wide and flat. The carriage of the Spanish is "upright, with proud action," while its plumage is short and close. Cocks weigh 7 lb., and hens 6 lb.

Variety and Colour. There is only one variety of this breed, viz. the Black, although Whites have been seen—the albinos of their kind, but they are not now in existence. The colour of the plumage is black with a beetle-green sheen, free of purple bars, while the beak is dark horn, the eyes black, the comb, face and wattles—except on the inner parts near the throat—bright red, the face and ear-lobes white, and the legs and feet pale slate.

Utility Properties. The breed has been for so many years artificially treated by exhibitors that what great laying powers it once possessed have been ruined, while stamina has been so much reduced that the chickens are somewhat difficult to rear, and they feather slowly. I have seen Spanish fowls running at large in all sorts of weather, and in some of the coldest parts of the country; but such treatment would be too much for them nowadays. However, they are well adapted to thrive in confinement.

Standard Requirements. The head is the most important point in exhibition specimens, and 50 per cent is allowed for it, viz. 35 per cent for the face and lobes, and 15 per cent for the comb and wattles. Type and size also get 15 per cent each, and colour and condition 10 per cent each. The face is practically the "be-all and end-all" of the breed. Any sign of blue, pink or red in it, or coarseness, is a serious defect. In birds of coarse quality the cauliflower-like ruggedness of the face is apt to grow over the eyes in such a manner as effectively to impede the eyesight. The appearance of pink on the face is certainly fatal from an exhibition point of view, but it is frequently seen just above the eyes. In quality and colour it should be like that of the finest white kid gloves.

Breadth of bib is a good point, as the breadth tends to push the sides of the face back and makes them fall flat on the neck, which, naturally, has the effect of increasing the expanse of face. In the matter of faces in the hens there are two distinct varieties—one long and relatively narrow, the other short, but wide and flat. This latter is preferable, because it shows to better advantage in the show pen. The breed is such a difficult one to exhibit to perfection that one has to be a fancier to go in for Spanish.

The Sultan (Non-sitter)

The Sultan fowl is considered by some people to be a native breed of Turkey; but there can be little doubt that it belongs to the Polish family. Eighty or more years ago Sultan fowls reached England direct from Constantinople; but the breed was known long before that time, and it was found in Southern Russia. These birds are what may be termed small Polands

—but, like the ordinary Silkies, not bantams—although they have well-feathered shanks and feet, are vulture hocked, and five-toed.

General Characteristics. The Sultan belongs to the light and non-sitting class. The cock's body is deep and comparatively long, although, owing to the saddle furnishing and the full neck-hackle, his back is apparently short. His wings are long and large, and carried somewhat low; and his tail, long, broad and fan-shaped, is furnished with very long and fine but upright sickles—i.e. the tail is carried high—while it has numerous long and fine hangers, and lengthy and abundant coverts. His head is of medium size, the beak short and curved, and the comb V-shaped, very small and consisting of two upright spikes only, and almost hidden by the crest, which, in formation, is very similar to that of the Houdan.

The face is covered with muffling; and the beard and whiskers are very full, concealing the small round ear-lobes, and almost hiding the wattles. The eyes are oval, and the nostrils large and horny, rising above the curved line of the beak. The neck is short, carried well back, and abundantly covered with hackle feather. The legs are short, the thighs having heavy vulture hocks which cover the joints, and the shanks are heavily feathered inside and out, the feather extending to the middle and outer toes. The feet are five-toed and well spread, the fifth toe being distinct from the others. The hen is similar to the cock, allowing for the natural sexual differences, but her crest is globular and very full in front, and her tail is well spread. The general shape is deep and the carriage sprightly, while the plumage is long, very abundant, and fairly soft. Cocks weigh about 5 lb., and hens 3½ lb. to 4 lb.

Variety and Colour. There is only one variety, viz. the White, the plumage being snow-white to the skin. The beak may be white or pale blue; the eyes are red, the face, comb, ear-lobes and wattles bright red—the face covered by the whiskers, and almost invisible—and the legs and feet pale blue.

Utility Properties. The Sultan is a hardy breed, and the chickens are not troublesome to rear, as they feather in a reasonably short time, considering the amount of plumage with which they are eventually furnished. There was a time when hens of the breed produced large white eggs; but few, if any, of those fanciers who admire the breed for its quaintness find this to be so nowadays. It is kept solely for its beauty, but, even then, by no means extensively.

Standard Requirements. The most important parts of the Sultan are its head and legs, since 15 per cent each is allowed for the crest, for the beard and whiskers, and, too, for the leg and foot feathering, while the comb gets 5 per cent. The remaining 50 per cent is made up with 15 per cent each for colour and condition, 12 per cent for type, and 8 per cent for size. It is necessary to preserve the feathering of the head and feet, hence show birds must be kept in confined runs and very carefully tended.

The Sumatra Game (Sitter)

As the name suggests, this breed is a native of Sumatra, the principal island of the Sunday group in the East Indies; and it lives there much as the pheasant lives in England. In old poultry books it is referred to as the Sumatra Pheasant Game. The birds were first domesticated in Canada and the United States of America; and it was during a tour of the establishments of several fanciers of America that an old friend of mine came across the breed in 1902. Two years later it became known in England, a Norfolk fancier importing some birds from Canada.

General Characteristics. The breed, being a true Game fowl—although carrying much more feather than the old Game cock of England—belongs to the general-purpose class. The cock's body is moderately long, firm and muscular, round-fronted and broad at the shoulders. His wings are large and strong, the front slightly raised, but the feathers folded closely together. His saddle-hackle is long and flowing, like his neck-hackle, and his tail is long and drooping, with a large quantity of sickles and coverts, which should rise slightly above the stern and then fall streaming behind nearly to the ground, the feathers being somewhat narrow.

His head is rather short and somewhat rounded, the beak strong and curved, the eyes large and bright, with a quick and fearless expression. His comb, of the pea type, is low in front and fits closely; and the smaller it is, so much the better. His face is smooth and of fine texture, and his ear-lobes and wattles are small and closely fitting. His legs are strong, of strictly medium length, the thighs muscular, the shanks round and having smooth and even scales, his feet broad and flat, and the toes (four) long, straight, and well spread, the back toes standing well backward and flat on the ground. The cock should be rose-spurred, i.e. have two spurs on each leg, which is one of the characteristics of the breed. The bird's plumage is very full and flowing, but not soft or fluffy, while its carriage is pheasant-like. Cocks weigh 5 lb. to 6 lb., and hens 4 lb. to 5 lb.

Variety and Colour. There is only one variety, the Black. The plumage is very rich glossy bottle-green or green-black with the very maximum of sheen. The beak, legs, and feet may be dark olive or black, the former for preference, while the eyes may be dark red, dark brown, or black, and the face, comb, ear-lobes and wattles black (gipsy) or very dark red.

Utility Properties. It has truly been said that Sumatra Game are not world-beaters at laying; but they are Game fowls, and, as such, are equal to the best of our Game for egg production, the eggs being tinted and of marketable weight. The birds are, however, excellent as table fowls, as they are small-boned, carry a large quantity of breast meat, and have a very fine skin. The breed is extremely hardy, while the hens are ideal sitters and mothers, looking well after their chicks, which are easy to rear.

Standard Requirements. The scale of points for this breed is well proportioned. Thus, head and type get 20 per cent each; colour, feather (quantity of), and condition 15 per cent each, legs and feet 10 per cent, and neck 5 per cent. A neat head, embracing a small comb, dark eyes, and gipsy face, gives the bird an alert appearance, while a brilliant green sheen is also essential, particularly in the male bird, as are good type and carriage. This last point is important, because nothing spoils the appearance of a Sumatra more than a high tail carriage; the tail should make no angle with the back, merely being a continuation of the back. The cock's legs, too, should be rose-spurred, because, while the single spur of the ordinary male fowl is permissible, this characteristic of the breed is being lost.

The Sussex (Sitter)

It has been said that the Sussex fowl came over with the Romans when they invaded Britain in 55 B.C. However, there can be little doubt that the breed as we know it was evolved from the farmyard fowl, so common in the south-eastern counties of England a century or so since. Ancient as its origin unquestionably is, it was not until A.D. 1904 that much was known of the Sussex, as a distinct breed, outside the county from which it derived its name. In that year a somewhat extensive classification was provided for it at the Royal Agricultural Show. In 1903 the Sussex Poultry Club came into existence, "to fix a standard for Sussex fowls with a view to improving the breed." During November of that year it got its first display at a poultry exhibition, viz. at Lewes, Sussex, where the local Fanciers' Association put on classes for Light, Red or Brown, and Speckled.

In the early part of its career as a fancy fowl it had to pass "the acid test." This caused some of the old breeders greatly to resent the severe criticism to which it was subjected by "outsiders." Nevertheless, the controversy it created was magnificent publicity for the breed. One may here note that at that time even the men of Sussex themselves, those who had been keeping the breed for ages, were not exactly agreed as to the names for the different varieties, or which colours should be termed Sussex.

The Speckled is the oldest variety of the breed, but it was first known as the Spangled, and was also termed the Speckled Dorking fowl, being somewhat common in the farmyards of Kent, Surrey, and Sussex. In its early days it resembled the Spangled Old English Game in colour and markings. Later on, when being bred for the show pens, there was great difficulty in distinguishing it from the Diamond Jubilee Orpington

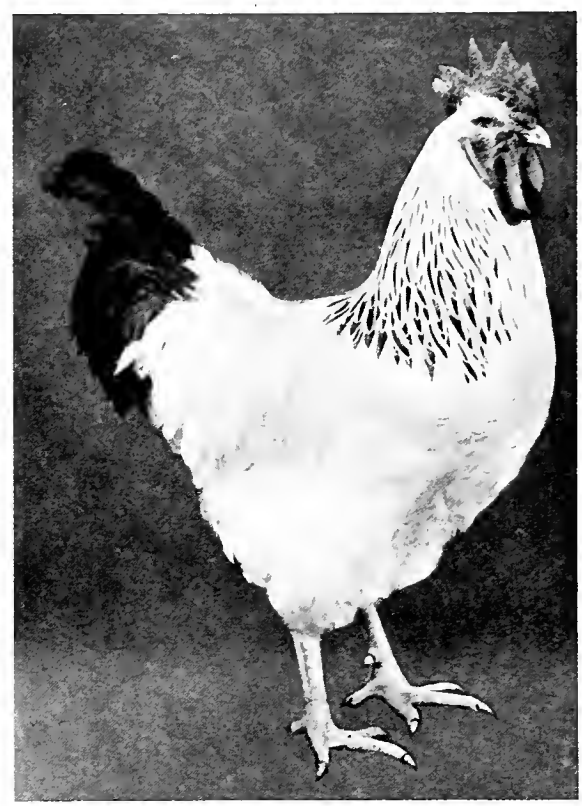


FIG. 180. A LIGHT SUSSEX COCKEREL

—a variety long since defunct, by the way. Eventually, however, it came into its own; and for beauty I doubt if there is a more taking fowl than the Speckled Sussex as now exhibited.

Although the Light did show some black in its hackle, tail and flights—it was bred from the Light Brahma, crossed with the old Dorking fowl—it was invariably called the White. As a matter of fact, a pure White Sussex (without any black markings whatever) was launched at a later date as the Albion, but it made very little headway under that name, and was subsequently "absorbed" as the White Orpington.

Then, again, the "Red or Brown" was decidedly not the Red as we now know it, because the cock had an almost solid black breast. The colour of the hen,

too, when not mostly black, was somewhat similar to that of the Brown of to-day. Had breeders been content to let the colour remain as a black-red, and not the "proper Red Sussex cattle colour," there would never have been a Brown Sussex. There can be little question that the old Red Dorking (or Kent or Sussex fowl) and the Black-Breasted Red Old English Game had much to do with fixing the Red Sussex.

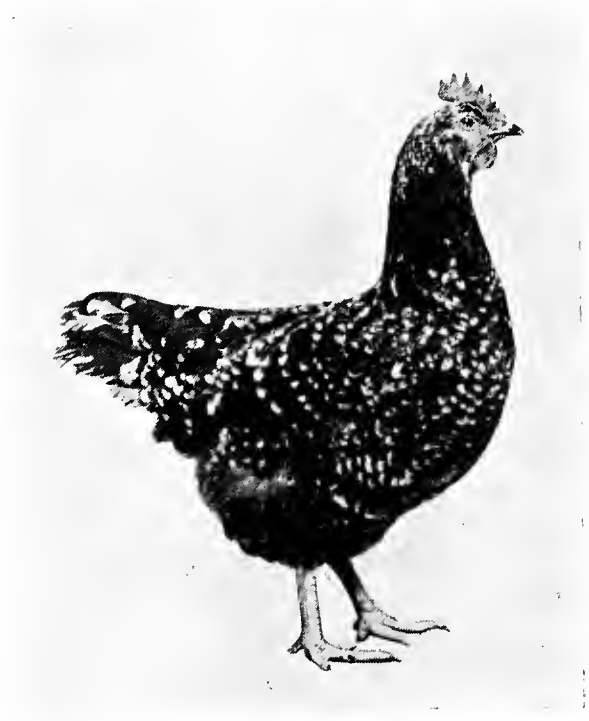


FIG. 181. A SPECKLED SUSSEX HEN

There was a tremendous amount of opposition among poultry-breeders in Sussex to allow other than the original trio to become known as Sussex fowls. Even the Brown—which resembles a Black-Red—had to fight hard to be recognized as belonging to the breed. As the Sussex became known, however, its varieties increased, and the Buff as well as the White were subsequently brought out, and then acknowledged by the Club. As far as I can gather, the first mention of the Buff variety was at the Dairy Show of 1921, when a pullet was entered in the "Any Other Distinct Variety" class. I did not see that specimen; but at Sevenoaks Show in November, 1922, I saw a couple of Buff Sussex hens exhibited by a local fancier. They were buff fowls of true Sussex type, and with black-striped neck-hackles. The great difficulty at that time was to get a male bird to match. However, the colour is bred reasonably level in both sexes now.

General Characteristics. The breed belongs to the general-purpose class, with a particular leaning to the table side rather than as a record-breaking layer. The body is broad, deep, and long, the breast almost square, the shoulders wide, and the back flat. The head is neat, the comb single, somewhat small, and upright in both sexes. The neck is of medium length, with fairly full hackle. The wings are closely tucked up, and the cock's tail is of medium size and carried at an angle of 45 degrees. The legs are fairly short. The thighs are stout and the shanks strong and free from feather, the toes (four) being long and well spread. The general carriage is graceful and erect, the plumage close, and the movement active. Cocks scale 9 lb., and hens 7 lb.

Varieties, Colour, and Markings. Six varieties are standardized, the Brown, the Buff, the Light, the Red, the Speckled and the White, and all are single-combed. Others have been exhibited; and the latest is the Partridge, exhibited at the Crystal Palace and Olympia Shows in 1934. The Brown is practically a Black-Red. The cock's hackles are dark mahogany striped with black; back and wing bows rich dark mahogany; wing coverts (bar) blue-black; secondaries and flights black edged with brown; and breast, tail and thighs, black. The hen to match him has a brown hackle striped with black; dark brown back and wings finely peppered with black; pale wheaten-brown breast and under-parts; black flights edged with brown; and black tail. The Light's plumage is pure white with black striped neck-hackle—the black of each feather entirely surrounded by a white margin, and finishing in a white point, not a black tip or black outer edging. The tail is black, and there is black in the flights. The colour of the Red is a rich dark red, uniform and free from "pepper," with black striped neck-hackle, black in flights, black tail, and slate undercolour.

The Speckled is a three-colour variety. The cock's hackles are rich dark mahogany, striped with black and tipped with white. His wing bow is speckled; primaries white, brown, and black. His sickles (tail) are black with white tips. The remainder of his plumage is rich dark mahogany (brown) free from "pepper," each feather with a small white tip or spot, and a narrow black bar dividing the white from the mahogany. The three colours are bright and show distinctly (neither colour running into the other), thus giving the desired speckled effect. The undercolour is slate and red, with a minimum of white. The hen's tail is black and brown with white tips, while her hackle and body are rich dark mahogany, each feather speckled with white (tip) and black bar as in the cock. The shade of Buff favoured is rich even gold; the neck-hackle is sharply striped with green-black, and black is allowed in the flights (wings), while the tail

is green-black. In all varieties the beak may be white or horn, the comb, face, wattles and ear-lobes are red, and the legs, feet, flesh and skin white. The eyes are red, except in the Light and White, where they are orange, and in the Brown, brown or red.

Utility Properties. The Sussex is, unquestionably, an excellent all-round breed. Sussex poultry rearers have been famed for the production of the very best table poultry, and the Industry has been associated with the county for hundreds of years. It can readily be imagined, therefore, that the true Sussex fowl has been bred purely and simply for utility. Poultry-keepers of bygone days were very careful to select their birds for fineness of flesh, thinness of skin, good form and size. Where big table fowls of superfine quality are required, the Sussex ranks high, since it grows quickly, and to a good size. The type, too, is ideal for the purpose. Moreover, they lend themselves well to artificial cramming when being fattened.

Having such great table properties it might be thought that the Sussex cannot be much of a layer. But it is not so. From its earliest days it always held its own as a winter layer, simply because the chicken season for the production of market birds began in December, and plenty of eggs were always forthcoming. As a matter of fact, it ranks among the best of the general-purpose breeds for egg production. Both hens and pullets are fine layers of big brown-shelled eggs. They are, too, close sitters and capital mothers, when broody hens are required; but they can easily be "broken." Moreover, proper management ensures the minimum of broodiness. They can be kept profitably in small quarters, but they give of their best when on a wide range, since they forage well. The chickens are very hardy, and they will adapt themselves to any locality, while it is an unusual thing to lose a youngster from cold or damp.

For Sex Linkage. The Sussex can be sex-linked within itself. The Brown, the Red, and the Speckled on the male side are golds, while the Light hen is a silver—there is, in fact, no better silver for the purpose. Possibly, too, the Buff cock will respond as a gold, and the White hen as a silver. These I have not tried to link. However, the other four varieties are, respectively, true gold and silver. There would be little, if any, benefit for utility to sex-link within the Sussex itself. For the show pen, though, the union of Brown (male) with Light (female) is interesting.

Of course, the Sussex is best known for sex linkage through the Light hen. She gives perfect results when mated with any of the numerous breeds and varieties of males classified as golds. What is so beneficial in her use for the purpose is that her sons almost invariably take after her in plumage and general characteristics. That is, the cockerels, no matter of what gold breed their sire, look like Light Sussex. This may not be of much importance to some poultry-keepers. It is, however, to those who are in touch with the table chicken trade, because the birds can be developed into first-class market specimens. Any of the Sussex gold cocks, too, will prove serviceable to run with such a silver as the White Wyandotte hen. Some of the cockerel progeny may have a few coloured feathers and others be more coloured than white. But they can be marketed young, while the pullets will be profitable layers.

Standard Requirements. If we take the scale of points as an indication of which are the most important parts of the fowls for show purposes—as such scales are intended to suggest—then type ranks first in the Sussex, since in all varieties it gets 25 per cent. In the White, however, size is equal to it, and colour 15 per cent; but in the other varieties, both size and colour are given 20 per cent each. Head points in the White are allowed 15 per cent, and legs (and feet) 10 per cent; but these percentages are reversed in other varieties, while in all of them condition is given 10 per cent. Type is certainly the most essential part of this breed, and the type which ensures, first and foremost, sterling table qualities. There is just a fear that breeding the Sussex fowl primarily for laying capacity will very considerably interfere with the true type of the breed; and there was such a tendency, a few years ago, among utility enthusiasts, who favoured a stamp of bird with superfine bone and little breast meat, and very much below the standard size and weight. The Sussex is, before anything else, a prime table fowl.

The Welsummer (Non-sitter)

Possibly, the Welsummer is not as well known to the average poultry-keeper as, for instance, the Leghorn; but it enjoys a certain amount of popularity in the exhibition arena. When classes are provided for it—and almost invariably now in the utility section—they usually result in substantial entries, particularly if a specialist is announced to judge. Beyond this, there is a strong club looking solely after its interests in this country. Members of that club have standardized the breed along English lines, and for productivity also; and they are popularizing it as a layer of rich brown eggs.

The Welsummer was evolved by poultry-keepers in a certain section of Holland solely for laying purposes —to produce eggs with very dark brown or coffee-coloured shells. It was done to supply markets with eggs likely to fetch top prices. Of its ancestors little is known. Until an attempt was made to standardize its breed points, all sorts of crossings of the local fowl with Brahmas, Rhode Island Reds, Croad Langshans,

Barnevelders, and Faverolles, had taken place. At the time it started its career in this country (in 1927), it was called the Welsum or Welsummer by English fanciers who took it up, one of whom, early in 1928, said: "The breed takes its name from the township of Welsum, in the Province of Overijssel." This authority averred that "The correct name is Welsummer," but he also said that the Dutch people spoke of it in short as the Welsum. It is well to recollect that, although the Welsummer may be a very old breed, it was not until early in March, 1928, that the National Poultry Union, created in Holland, aimed at the improvement of the Welsum fowl, to develop it into what we of this country consider a standard breed.

It was said that the large, dark brown eggs which for years were sold on certain Dutch markets originated from hens in the "Ysselstreek." They eventually became known locally as Welsums—the name of a village on the River Yssel. In those days the breed was little, if at all, removed from an ordinary barndoor fowl in appearance. This is understandable, because all sorts of crossings of the local bird had taken place, and the only thing that mattered was the rich brown egg of marketable size. For some time there was really nothing definite about the breed, externally, to distinguish it. Even as recently as 1930, at the World Poultry Congress held in London, there was considerable variation in the official Dutch exhibit of Welsummers; and fanciers in this country, looking for a lead as regards type, colour and markings, found it most difficult to know just what was required.

Records show that Welsummer fowls of a dozen years or so back were of a different type from those now seen in our country, while the male bird had blue in his breast, tail and wings. However, when the breed was taken seriously in hand by the National Poultry Union of Holland in 1928, a standard was formed. It was that standard which, with very few alterations, was adopted by the now defunct British Welsummer Society at its annual general meeting held at the Crystal Palace in 1929; a pamphlet entitled "The British Welsummer Fowl: its History, Standard and Merits" was published in that year by the honorary secretary of the society, and presumably it was officially sanctioned.

At that date (1929) the male bird's colouring was mentioned as "rich golden-brown, neck-feathering clear, red wings with black flights—generally marked like the Brown Leghorn, but with Black or mottled chest." The female's colouring was described as "rich brown with 'peppered' partridge markings; hackle and tail striped; lacing in proportion to the feather." This first English standard, however, was not fully approved; so, it has since been altered by breeders in this country as detailed below.

General Characteristics. In Holland the breed is referred to as a medium heavy. Such a term is not officially recognized in England; so it will probably be what some ultra-smart poultrymen term a heavy-light or a light-heavy breed. As a matter of fact, in the Poultry Club Standard it is classed as a non-sitter. It means that for show purposes it must be considered as a light breed. This undoubtedly it is, since as regards standard weights it comes between the Leghorn and the Minorca. The Welsummer has been described as a Brown Leghorn of sorts; and such an impression was probably gained from the allusions to the Italian breed in the first Standard for it published in England.

The Dutch breed, however, is of a more sturdy build, while not possessing the generally exaggerated head points and pure white lobes of the Leghorn. In body shape the Welsummer is not as racy, or of as fine bone. The cock's body is, for a light breed, broad, long and deep, the breast full and round, the back broad, and the abdomen deep and wide. The wings are moderately long and closely carried, while the tail is large and full, high, but not so as to merit the term "squirrel tailed."

The head is fine, the beak short, and the face smooth and open, while the eyes are bold and full, without any overhanging brows. The cock's comb, single, is fairly small (compared with the Leghorn) and upright, with five to seven broad and even serrations, the back of it following closely without touching the line of the skull and neck. The wattles are of medium size and the ear-lobes small and almond-shaped, while the neck is fairly long and abundantly feathered. The legs and feet are of medium length, the thighs clear of the body, the shanks fairly stout without coarseness, free of feather, and the toes (four) well spread. The Welsummer is an active fowl, "well built on good constitutional lines" as the club Standard describes it, and compact when handled. Its plumage is "tight, silky and waxy," to quote again from that Standard, silky at the abdomen, and "at thighs free of bagginess." The hen, in general characteristics, follows the cock, allowing for the natural sex differences; her comb falls slightly over one side of her head.

The Welsummer Club, having formed its standard for utility as well as show use, has the following concerning the handling of the hen: "Pelvic bones fine and pliable; abdomen pliable; flesh and skin fine in texture and free from coarseness; sleek in plumage; abdomen capacious, but well supported by long breast-bone and not drooping; general handling of a fit, keen, and active layer." The standard weights

are 7 lb. for cocks, 6 lb. for cockerels and hens, and 4½ lb. to 5 lb. for pullets.

Variety, Colour, and Markings. So far there is only one variety—it is known simply as the Welsummer. In colour, etc., it more closely resembles what fanciers term a pullet-breeding Partridge, Black-Red, or Brown than any other. The plumage of the cock is brown, red, and black. His neck-hackle is rich golden-brown, uniform and free from striping; and his back, shoulders and wing bow are bright red-brown. The wing bar, broad, is black with green sheen, as is the main tail, but the remainder of the wings is brown and the tail coverts (lower) black edged with brown. His breast is black with red mottling, and his fluff (abdominal and thigh) black and red mottled.

The hen's head is golden-brown, and her neck-hackle rich golden-brown or copper, the lower feathers with black striping and golden shaft. Her breast is rich chestnut-red, her tail black with brown pencilled outer feathers, and her abdomen and thighs brown with grey shading. Her back and wing bow are red-brown, each feather with a light shaft, and the webbing stippled or peppered with black to give a partridge effect. The wing bar is chestnut-brown, while the secondaries are brown (outer web) stippled with black, and the primaries (outer web) brown. In both sexes the beak may be yellow or horn; the eyes are red, the head points (comb, face, wattles, and ear-lobes) bright red, and the legs and feet yellow. The undercolour is dark slate-grey.

Utility Properties. No doubt the great attraction of the Welsummer is its brown eggs. It is, however, more a general-purpose breed, though of the light class, than simply a layer. Undoubtedly, the egg colour is an advantage, because for some reason many folk imagine that the contents of a brown egg are more nutritious than those of a white, which, as practical men know, is fallacious. Then, too, it might be advantageous for those poultry-keepers who have to contract with London egg salesmen. These buyers have demanded 60 per cent of brown eggs in future consignments, although whether they will succeed in their demands remains to be seen.

However, the breed is not yet so popular, or such a prolific producer, as to tempt a commercial egg-farmer to concentrate solely on it for supplies of market eggs. Neither, in my opinion, would it be wise to dispose of Welsummer eggs at the usual rates offered by such buyers, although they are excellent for a private trade.

It must be remembered that the breed is, even yet, in the raw as far as this country is concerned. In my view a great disservice was rendered by some of those who first took it up in England by their greatly exaggerating the Welsummer's utility properties, and, too, by misleading the public regarding its type. Thus, it was written up as "The only Mediterranean type laying a dark brown egg." It was also spoken of as "somewhat resembling a Brown Leghorn." Yet it is, undoubtedly, of Dutch origin and without the least drop of Mediterranean blood in its make-up. Worse than this, however, it was claimed to be a layer of "three oz. eggs at least" while its usual production was said to be 240 to 250 per annum, and all of a rich brown colour.

As a matter of fact, when the Welsummer first came into the limelight in England it was not a prolific layer. The average for 100 picked hens was 130 eggs. Later, this was increased to 152 eggs, and there were champions who touched 234. Still, at least one member of the breed put up a very fine performance at the 1929–30 Harper Adams Laying Trial, a total for forty-eight consecutive weeks of 246 eggs of which no less than 241 were specials and the other five first-grade. Even though "one swallow does not make a summer," and such an outstanding result does not appear to have been repeated up to date, it is proof that laying records can be improved by those who have the patience to "make haste slowly."

No doubt, when the Welsummer gets better acclimatized to the vagaries of our weather it will not disappoint those who take it up. At present—and I write from personal experience with it—the pullets give better results in protected runs than in exposed positions, despite semi-intensive methods. The birds have to be early hatched to commence laying in autumn, and, generally, they require at least six months in which to mature for egg production. That, in fact, is when they are reared and kept in well-protected situations although at free range. The pullets begin with the usual pullet eggs, while it is the exception and certainly not the rule for yearling hens to produce 3 oz. eggs. The eggs, too, are sometimes so thick-shelled, and the membrane so tough, that the hatching results are rather poor. This, at any rate, was my experience until the matter was thoroughly investigated and a remedy found. Nevertheless, as I have said, the breed reached England only a few years back and, candidly, in a raw state as far as performance was concerned. While the vast majority of the eggs are brown-shelled, many of them a deep red-brown, there are variations in the pigmentation. Still, as a pullet almost invariably follows her dam in the colour, shape and texture of the egg, and her sire's strain in numbers and size, these are the points for which to select the breeding stock.

As regards table qualities, the cockerels generally find a ready sale at 3½ lb. to 4 lb. I have disposed of surplus birds of such weights, taken on the spot without plucking and dressing, at 1s. a pound whole-

sale. They are generally of too active a nature to stand coop-feeding and cramming; but they thrive well on range and eat sufficient mash to make them plump and fleshy for market. Of course, well-bred cockerels ought not to be killed for table, since it should be possible to dispose of them for stock. No matter with what breed they are mated they improve the colour of eggs laid by the pullet progeny. For this purpose alone I have mated spare Welsummer cockerels with breeds other than for sex linkage, with Rhode Island Reds, Black Leghorns, and even farmyard hens. Welsummer-Rhodes lay rich brown eggs, almost as good as the pure Dutch, while the Welsummer-Black Leghorn eggs are a really good brown and not merely tinted.

For Sex Linkage. The breed being a "gold," the cockerels can be used for sex linkage with any "silver" hen. The best, possibly, is the Light Sussex; and my experiments in this direction have proved eminently successful. The cockerels of this union can be developed into market chickens, and they plump well with good feeding at range. The pullets mature reasonably early, produce rich brown eggs, and are generally of a pleasing buff colour as regards plumage.

Standard Requirements. Since one of the objects of the Welsummer Club is "to encourage and improve breeding Welsummers for utility purposes," the standard is fashioned on those lines. In the scale of points, therefore, "handling, size, and indications of productiveness" get 30 per cent. Then follow colour and general type, each 20 per cent, and head, legs, and condition each 10 per cent. Handling, in the Club Standard, is given as "compact"—or, to quote fully, the male bird "well built on good constitutional lines, yet handling compact; firm and neat in bone throughout," and the hen as I have already mentioned under general characteristics.

Size, of course, means weight, because in no standard is the actual size of the bird stated. Indications of productiveness refer not only to the general health of the bird, the brightness and colour of its eyes, the texture of its flesh and skin, the condition of its plumage, and other outward signs of robust constitution, but, in the hen particularly, to the fineness and pliability of the pelvis and the abdomen.

Colour is also important, even in this breed, which is being encouraged for utility purposes, because such minor faults as "striping in neck or saddle," and "absolutely black or whole red breasts," in male birds, "salmon breasts" in females, "legs other than yellow," and "white in lobes" in either sex, are standardized as serious defects. One can understand objection being taken to "any bodily deformity; coarseness, beefiness and anything that interferes with productiveness, and the general utility of the breed," because the Welsummer must stand or fall as a layer rather than a fancy fowl.

The Wyandotte (Sitter)

The Wyandotte is of American origin. It sprang from European and Asiatic breeds, admittedly; but the poultry people of America made it, so they justly claim it as their very own. Records show that in the early 'seventies apparently the same breed was being cultivated under various names, as if several fanciers were busy with it but could not settle its title! It was not until 1883, however, that the Wyandotte was admitted to the American Standard of Perfection, which fixed its cognomen for all time. The Silver-Laced was the original Wyandotte, and it is nearly seventy years since Mr. John P. Ray, of Hemlock Lake, N.Y., U.S.A., stumbled on this unique breed, while experimenting in 1868 on the crossing of Sebright Bantams with Shanghais in the hope that he would evolve a new variety of bantam. The progeny of this mating was known as the Sebright Cochin. A further crossing was made between Silver-Spangled Hamburghs and Yellow and Black Chittagongs or Dark Brahmas. From the progenies of these two crossings emerged what we now know as the Silver-Laced Wyandotte.

In 1876 an application was made to the American Poultry Association to admit it to the Standard under the name of the American Sebright, but this was refused owing to the difference of opinion upon its name and upon its comb, since some breeders advocated a pea comb and others the rose, which it now sports. Other names such as "Eureka," "Excelsior," "Ambright," "Columbia," etc., were suggested, until finally Mr. Fred A. Houdlette submitted "Wyandotte," the name of a favoured ship owned by his father; his suggestion was adopted, and the new breed was admitted to the American Standard in 1883.

The Gold is said to have resulted from crossing the Silver with the Winnebagoes, a golden plumaged fowl known in America at that time. But some fanciers, in England at any rate, got quite near the mark by mating Indian Game cocks with Silver hens. The White was simply a sport of the original variety; and I bred it that way some years before the White was known and when breeders insisted that the Wyandotte must be a laced fowl. The Black was probably a sport from the Gold to begin with; but out-crossing was resorted to before this variety was anything like established. The Buff is said to have originated in light coloured Golds crossed with the Buff Cochin, though some say it came from Silver hens crossed with Rhode Island Red cocks, and others claim the Silver and the Buff Cochin cross. As to more recent members of this large family—and it has probably the most

branches of any one-comb breed which the Fancy has known—it does not require much stretch of one's imagination to see the most likely sources of origin.

General Characteristics. The breed belongs to the general-purpose class, but on the light rather than the heavy side, because it is not as big or as heavy as the Orpington, either in body or bone. Half-way between the Hamburgh and the Brahma gives one a good idea of the Wyandotte. The body is deep and round and inclined to be short, somewhat similar to that of the Brahma, but not on such massive lines. The breast is broad and round, the back apparently short with breadth across the saddle, and rising with a slight depression to the tail, which is of medium length and, in the cock, furnished with well-curved, though small, sickles. The wings are closely carried and rounded; that is, when viewed from the front they must not give the bird a flat-sided appearance.

The head is short and broad, with an intelligent expression, for while the Wyandotte is a docile fowl it is no sluggard. The comb—always of the rose type—is the hall-mark of the breed, and if I mistake not, the only one of its kind. While the top of it is of oval shape and covered with the usual small round points, the outline viewed from the side is convex. Hence, with the well-defined spike at the rear which follows the downward curve of the skull, it gives one the impression of an inverted cradle rocker. The ear-lobes are oblong and the wattles of medium length and well rounded off, while the neck is heavily feathered. The cock's tail is spread at the base, the main feathers being carried somewhat upright and the sickles small. The legs are fairly short and set well apart, the thighs being visible. The shanks are fine and round and free from feather, and the toes (four) well spread.

The Wyandotte is a well-balanced bird, and although alert enough it never appears to be at all nervous or in a great hurry, if one may so put it. The carriage is more sprightly than that of the Orpington, but it lacks the bold "cock-sureness" of the Hamburgh. The standard weights are, for mature cocks not less than 8 lb., and hens not less than 6 lb., but a pound less for each sex would be advantageous. There must be no tendency to Leghorn type in the Wyandotte, although there has been much crossing of these two breeds to improve egg production.

Varieties, Colour, and Markings. Nineteen varieties of the Wyandotte have seen the light of day, and they are as follows: Barred, Black, Black-Laced, Blue, Blue-Laced, Buff, Buff-Columbian, Buff-Laced, Columbian, Copper, Cuckoo, Gold-Laced, Partridge, Pile, Red, Silver-Laced, Silver-Pencilled, Spangled, and White. There was a Violet-Laced, but it was the forerunner of the Blue-Laced. All are rose combed. Although there are almost twenty different varieties of the breed, only a dozen of them have been admitted to the Poultry Club Standard up to the present, and with these I shall deal, first of all, as regards their colour and markings.

The plumage of the Barred is similar to the Plymouth Rock, while the Black has the usual beetle-green sheen on the surface with as dark (black) undercolour as possible, and the Blue is of an even

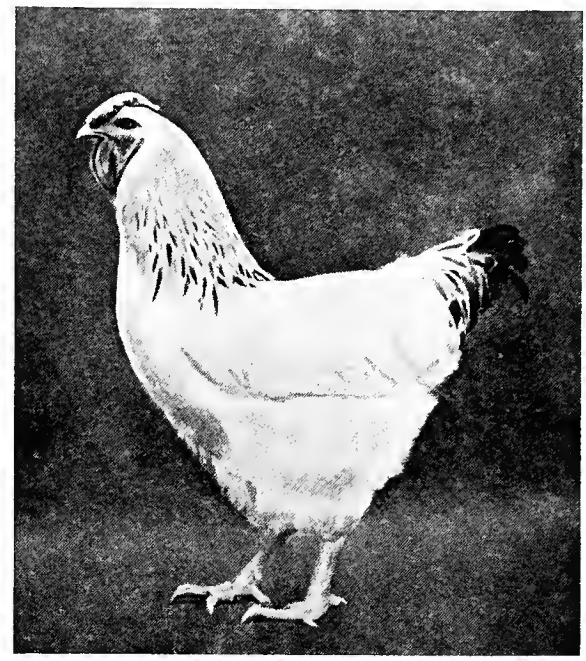


FIG. 182. A COLUMBIAN WYANDOTTE COCKEREL

shade, light to dark—although medium is preferred—free of any bronze, mealiness (light), and peppering (black), or sandiness, and without any indication of lacing. The Blue-Laced is a red-brown or chocolate-coloured variety with blue markings. The cock's hackles are distinctly striped (with blue) down the centre of each feather and free of black tips or black around the outer edge. His back and shoulders are without black or smutty blue, and his wing bars, laced (blue), are well defined, while his breast is regularly and distinctly laced (blue) from the throat to the back of the thighs—single lacing, without outer black or smutty markings. His fluff is powdered with brown or chestnut, and his tail is solid blue, free from black or white. The hen to match him has a similar neck-hackle and tail, while the remainder of her plumage is like his breast, viz. single blue lacing on red-brown or chestnut ground colour. The Buff is clear, sound buff throughout to the skin, like the Orpington, while the Buff-Laced in both sexes is similar to the Blue-

Laced, except that the ground colour is rich buff and the markings (striping and lacing) are white. The Columbian is pearl-white with black markings, like the Light Sussex.

The plumage of the Gold-Laced is rich golden bay with jet black markings showing a green lustre. The hackles have distinct bright stripes, one down the centre of each feather. The thighs and fluff are black or dark slate powdered with gold and clearly laced

FIG. 183. A SILVER-LACED WYANDOTTE COCK

around the hocks. The tail is black, the hen's coverts having rich bay centres. The cock's wing bow is rich golden bay, and his coverts are evenly laced and forming two or more well-defined bars. The remainder of the plumage of both sexes is sharply and regularly laced with black, one line around the outer edge of each feather and not double laced, or black with a bay outer edge. Except that the ground colour is silver-white instead of rich golden bay, the Silver-Laced is similar to the Gold-Laced.

The plumage of the Partridge requires more detailed description. To take the cock first, his head is dark orange and his hackles (both on the neck and the saddle) are bright orange-yellow, each feather having a centre black stripe. His back and shoulders are bright scarlet red, his wings rich bay with solid black bar, and his breast, fluff and tail black. His mate is a bird of marking, generally pencilled, but in the form of lacing which follows the outline of the feather. Her head and hackle are rich golden yellow, with fine pencilling on the large feathers, and her breast, back, cushion and wings are light partridge-brown, each feather plentifully and distinctly pencilled with black. Her fluff is brown with as much pencilling as possible, and her tail is black with or without brown markings. Although there is a Partridge variety of the Cochin fowl, the male bird of this particular member of the Wyandotte family has much brighter colouring, and the female is more sharply and distinctly pencilled. Except that the Silver-Pencilled cock has silver-white ground colour, and the hen steel-grey instead of brown, red, etc., of various shades, this variety is similar to the Partridge. The White is "as white as driven snow," without the slightest trace of straw or yellow.

These, then, are the standard varieties. The others, which have been exhibited at different times—and nearly all of which I have had the pleasure of judging—are as follows: the Black-Laced is simply a white-laced Black, that is, a black-plumaged fowl with white markings, the lacing, striping, etc., being of similar character to those of the other Laced varieties of the breed. The Buff-Columbian is buff where the Columbian is pearl-white, the markings being black. The Copper is a replica of the Golden Duckwing Leghorn; the Cuckoo is similarly marked and coloured to the Cochin, and the Pile follows the Pile Modern Game. The Red is of the same colour as the Rhode Island Red, while the Spangled is black and white like the Ancona. This last-named variety of the Wyandotte, it may be remarked, was brought out many years ago, by a well-known breeder of Anconas.

No matter what the variety of Wyandotte, the beak and legs are bright yellow (although a horn yellow shade is allowed on the beaks of some of them), the comb, face, ear-lobes, and wattles are bright red, and the eyes bright bay.

Utility Properties. To belong to the general-purpose class a breed must hold its own as a layer as well as a table fowl. The Wyandotte does both. The females are very good layers, especially in winter, while probably the best is the White, because it has been pedigree-bred and outcrossed for laying qualities. Although the eggs are not perhaps the biggest on record—size, after all, is a matter of selection and management—they have tinted shells and are of a class which meets with a ready sale at top price. The hens are steady sitters and splendid mothers, although some laying strains have been so carefully selected that brooding propensities have been almost bred out.

As table fowls Wyandottes are suitable for those folk who do not consider that yellow skin and legs are

objectionable—the flesh is plentiful and of good quality, while the bones are small. Being of a docile nature the birds can be fattened to good weights. For hardiness it would be difficult to find a breed to excel the Wyandotte, and it will thrive well under almost any condition, from free range to close confinement. The chickens are quick growers and easy to rear. They arrive early at maturity for a breed of their size, the cockerels being ready for the table at a youthful age, while the pullets can be brought into lay at six months without the slightest trouble. Of course, it is as all-the-year-round egg producers that they have gained so much popularity; but for general utility purposes they are well to the fore.

For Sex Linkage. Some of the varieties can be used for sex linkage. Thus, the Barred or the Cuckoo (hens) can be mated with any black breed of cock, such as the Minorca, Croad Langshan, Black Leghorn, etc., while any variety of "gold" male—such as the Brown Leghorn, Barnevelder, etc.—can be bred with the Columbian females. The Black cock can be linked with any barred or cuckoo variety of hen, such as the Scots Grey, or the Barred Plymouth Rock or Wyandotte. The Partridge, too, is a "gold"; hence the male bird of this colour can be mated with the Light Sussex or any other "silver" hens. A very popular union also, for sex linkage, is with White hens. The White was originally a sport of the Silver-Laced Wyandotte; if the hens are pure-bred and not containing any Leghorn or other foreign blood in the particular strain, they can be used with a fair amount of success.

When these hens are mated with a Rhode Island Red cock, the cockerel chicks are generally hatched white or of a cream tint with ticking on their neck, while some of them have dark markings on their backs and wings. A few, too, are almost white or black and white. The pullet chicks of this union, as day-olds, are of a medium gold, often with distinct brown markings on their heads, backs and sides. This link, however, of any gold male with White Wyandotte hens is by no means the best to enable the beginner to distinguish the sexes of the chicks practically as soon as they are hatched. Both cockerels and pullets vary considerably in their plumage (colour and markings) when the birds are matured, and many of the former have the appearance of mongrels. Still, although the pullets are not level in their adult feathering they can generally be divided into three groups, viz. red, white-laced buff, and wheaten. They are certainly striking looking fowls.

Standard Requirements. So widely different are the scales of points for the several varieties of the Wyandotte that it would be tedious to give the whole of them. In the Poultry Club Standard alone there are thirteen such scales, and only in the Gold-Laced and Silver-Laced varieties are they the same, viz. colour and markings 61 per cent, head 19 per cent, size and condition 14 per cent, and legs 6 per cent. In the Laced varieties, and in the Columbian, the Partridge, and the Silver-Pencilled, colour and markings, always combined, rank as of most importance, as does colour in the Black and the Buff, while in the Blue and the

Fig. 184. A White Wyandotte Pullet

White, colour is level with type, and each stands at the head of the list with 25 per cent.

As showing to what extent these points (colour and markings) are considered of importance in exhibition specimens, it may be said that in the Blue-Laced they get 64 per cent for the cock and 73 per cent for the hen, in the Buff-Laced (either sex) 70 per cent, in the Columbian 40 per cent, in the Partridge cock 58 per cent and hen 53 per cent, and in the Silver-Pencilled 63 per cent for the cock and 58 per cent for the hen. As can be imagined, therefore, they are the essentials for which to breed if success is desired in the show pen. Even in the "self" varieties, colour is of some account, since in the Black it is 35 per cent, in the Blue and the White 25 per cent, and in the Buff 40 per cent. In the standard description of the Gold-Laced there is a note to the effect that brightness and uniformity of ground colour (rich golden bay) are considered of more value than any particular shade,

while regularity of lacing throughout the plumage is of first importance; and in connexion with the Silver-Laced hen "regularity of lacing and quality of colour in all cases must count above any particular breadth of lacing."

It is the general consensus of opinion among breeders of standard stock that all varieties of a breed should conform to the general characteristics of that breed; but this is not found in the Wyandotte to-day, and I doubt if there is any other race of fowl which has such a difference of type (or shape) as has this one. It can scarcely cause surprise, however, in view of the fact that type, which is so necessary to enable us to distinguish between the different pure breeds of fowl, is omitted entirely from the pointing of some branches. This occurs in connexion with the Blue-Laced, the Buff, the Buff-Laced, the Gold-Laced, and the Silver-Laced, as well as the Silver-Pencilled cock, while the hen of this last-named variety gets 10 per cent. On the other hand, type is given a reasonable percentage in the scales of points for the Blue and the White. The same percentage (25) is allowed for the Black and the Columbian, but in the Partridge it is given 12 per cent. In varieties in which there is little or no incentive to breed for true Wyandotte type, fanciers have concentrated on colour and markings, with the almost inevitable result that these varieties have been overdone for exhibition—they have been "show spoiled," while they have lost what utility properties they originally possessed. As long as the standard remains as it is, though, or at any rate until the scales of points for most of the varieties have been drastically revised, the breed will be one of colour and markings rather than one of a type which, it will be agreed, has some usefulness in it.

I have said, in describing the general characteristics, that the comb is the hall-mark of the breed, and the only one of its kind, of a stamp which is commonly referred to as "cradle" shaped. Comb, however, is specified in only four of the scales, viz. 8 per cent in the Buff, 10 per cent in the Columbian, 7 per cent in the Partridge cock and 6 per cent in the hen. In every other variety it is included in "head," which embraces comb, face, ear-lobes, wattles, eyes, and beak. The highest percentage allowed for head points is 22 (in the Buff) and the lowest 8 (in the Silver-Pencilled hen); but although there are "serious defects," such as permanent white or yellow in ear-lobes covering more than one-third of the surface; comb other than rose, or falling over one side of the face, or so large as to obstruct the sight; wall eyes, green eyes, or eyes which do not match, i.e. odd coloured eyes, and overhanging eyebrows, this special feature of the Wyandotte, the cradle comb, in most varieties is not given the importance it deserves. And yet, if the comb be flat-topped and with a leader (or back point) which sticks out or up, or the whole comb is high, it detracts very considerably from the appearance of the bird. Except in the Black and the White varieties, therefore, the Wyandotte is not a breed likely to appeal to any but the most expert fanciers.

The Wyndham Black (Non-sitter)

The Wyndham Black was produced by a poultry-farmer residing in the district of Wymondham, Norfolk, who declared that the Ancona, the Minorca, and the White Wyandotte were the only breeds used for the purpose. Males of the Minorca-Wyandotte cross were mated with females of the Ancona-Wyandotte cross; and in time the breed was launched under the above title and passed by the Poultry Club Council in July, 1933, for inclusion in that club's Standard.

General Characteristics. The Wyndham Black belongs to the non-sitting class, and in general characteristics it closely resembles the Minorca, an active fowl with bold upright carriage, and having close and compact plumage. The weights are as follows: Matured cock 8 lb., cockerel (six months) and hen 6 lb., and pullet (six months) 5 lb.

Variety and Colour. There is, of course, only one variety, the Black. Its plumage has the usual green sheen, while the undercolour may be black or dark smoke, but any white in the undercolour is a serious defect. In both sexes the beak is dark horn, while the eyes are amber (with dark pupil), the comb, face, ear-lobes, and wattles red, the legs and feet black or very dark slate, and the soles grey.

Utility Properties. Of its utility properties little is known by the general public; but although it is a non-sitter and was accepted by the Poultry Club as a light breed, it is a dual-purpose one. The cockerels carry a nice quantity of breast meat with no excess of bone; and with normal feeding they will dress up to 4 lb. for the table at sixteen to eighteen weeks, while the skin and flesh are white. The females are good layers of lightly tinted eggs; and as indicating production the following figures were supplied to me: One batch of twenty 1932-hatched pullets averaged 252 eggs in their first full year of laying and 198 in their second, while a similar batch (hatched at the same time) averaged 248 in their first season and 205 in their second. In 1934, to maintain stamina for the breeding pens, twenty-six 1933-hatched pullets were kept on a limited grass range—throughout a particularly dry summer, it will be recalled—and fed with growers' mash, which never had more than a 5 per cent albuminoid content, and the result for the full year was 4747 eggs, which is equal to 182·6 for

each bird. As pullets are not bred from, the standard weights are well maintained. The special feature of this black breed of fowl is that it is auto-sex-linked, the cockerel chicks having white throats and fronts when the birds are hatched, the pullets being all black or black with smoke-coloured necks.

For Sex Linkage. Although the breed is, as I say, auto-sex-linked—which obviates the expense of sexing day-old chicks by the Japanese method—males can be mated with pure-bred Light Sussex hens for sex linkage. This union produces cockerels (silver) which are particularly good for market purposes, having white flesh and shanks and scaling 4 lb. at fourteen weeks, while the pullets (gold) will weigh 5 lb. at twenty weeks and start laying at under six months, some at twenty-two weeks, and in appearance these latter birds resemble the Brown Leghorn.

Standard Requirements. The most important parts of the Wyndham Black, according to the scale of points, are colour and head, each of which gets 25 per cent, the total for the latter being made up of comb 10 per cent, eyes, ear-lobes, and beak 5 per cent each. The remaining 50 per cent is equally divided between type, size, legs, condition, and "dual-purpose indications."

The Yokohama (Sitter)

The Yokohama is among the oldest breeds of fowl in existence, since while it has been bred in England for only about seventy years, it is an ancient breed of Japan, where it originated. The Japanese call their birds Shinowaratao or Shirafugi, but in our country all varieties are known as Yokohamas, although at times they have been referred to as Japanese Game and Japanese Longtails.

There are really two distinct varieties of the breed, viz. those with single combs and others with pea combs; and, abroad, the former are always spoken of as the Phœnix fowl, the pea-combed birds being known as Yokohamas. The single-combed species have the longest tails and feather generally, and they are undoubtedly the original, their varieties being Golden-Hackled (the colour of a Black-Red Game fowl), and Duckwing (Golden and Silver), although some very full-feathered single-combed cocks have been exhibited in England. The pea-combed varieties are the Red-Saddle and the White; but, in our country, both the Golden-Hackled and the Duckwings have been shown with pea combs, and some Whites with single combs, which proves, of course, that the varieties have been crossed. This mixing of the two kinds does not appear to have occurred in other countries, where each colour is shown with the correct and characteristic shape of comb; and all the Japanese drawings and photographs which I have seen of these long-tailed Japanese fowls have depicted the birds with single combs.

General Characteristics. The breed is classed as a general-purpose one; but although its body is compact, it is of light weight compared with the usual run of such fowls. In general characteristics it is very similar to the Sumatra Game, but it differs from that breed in comb and plumage. That is, the comb is single, small and even on the Phœnix, and pea on the Yokohama—this latter, admittedly, being the same as the Sumatra. The cock's tail is long and flowing, and furnished with a great abundance of side hangers; but while the Standard demands that the sickles and coverts be narrow and hard, and that the whole tail form a graceful curve and be carried somewhat low, tails of these birds have been reported to be 23 ft. long, while the hangers have not only touched the ground but trailed on it when the fowls have been walking.

Way back in the 'seventies or 'eighties I understand that there were preserved in the Japanese Great National Museum at Tokyo two Yokohama fowls whose sickle-feathers measured 13½ ft. and 17 ft. respectively. A Japanese authority has stated that a tail has been measured 23 ft. in length; but, as far as I can gather, Yokohama cocks with tails exceeding 6 ft. have never reached Europe, while in Japan itself specimens with tails over 6 ft. are exceedingly rare. The sickle-feathers grow about 2 ft. the first year; but although they increase in length after each moult, their limit appears to be 5 ft. Two of the chief points of the breed are that the hen's back is long, tapering to the tail and furnished with long saddle-hackle, and that her tail is very long and carried horizontally, the two top feathers of it being gracefully curved and the coverts sickle-like. Cocks weigh 4 lb. to 6 lb., and hens 2½ lb. to 4 lb.

Varieties, Colour, and Markings. In the Poultry Club Standard, and the Standard issued by the Yokohama Club of England, six distinct varieties are mentioned, viz. Golden-Hackled or Black-Red, Duckwings (Golden and Silver), Spangled, and White Phœnix, and Red-Saddle and White Yokohamas. Among poultry fanciers generally, however, these long-tailed Japanese fowls, no matter what their type of comb or their colour, are called Yokohamas. The plumage of the Duckwings is similar in colour and markings to that of the Modern Game fowl, but all the black feathers have a metallic lustre instead of the usual beetle-green sheen, while the legs may be willow or slate-blue.

The Golden-Hackled is the colour of a Black-Red Game fowl; the beak is horn-coloured, the eyes are ruby-red, and the comb, face, and wattles bright red, while the ear-lobes may be pure white or red, and the legs and feet yellow, willow or slate-blue. The

plumage of the Red-Saddle is red and white. The cock's breast and thighs are red, and the hen's red buff, with distinct white lacing around the outer edge of each feather, while the cock's back and wing bows are crimson red, the former vignetted into the saddle, and the remainder of the feathering white. In this variety the beak is yellow; the eyes are ruby-red, the comb, face, ear-lobes, and wattles bright red, and the legs and feet bright yellow.

The Spangled cock's head, back, wing bows and neck-hackle are white, the hackle with a narrow black stripe down the centre of each feather near the base. His breast, thighs, and fluff are black, with white tippings in the form of a crescent. His saddle-hackle is white near the wings, then slightly striped with black, the stripes becoming heavy as they approach the tail, while his wing bar is black with white lacing, and his tail black, the lower coverts distinctly laced with white. The hen to match him has a white head, breast, thighs and neck-hackle, the latter striped with black; white back slightly pencilled or laced with black, and black tail, the coverts evenly laced all round with white; and except that the lobes are bright red and the legs willow or slate-blue, the other head points are the same as those of the Golden-Hackled.

The White is snow-white, free of any straw tinge, but whereas in the Phœnix the beak, legs and feet are yellow, the eyes ruby-red, and the ear-lobes white, in the Yokohama (White) the beak, legs and feet may be white or yellow, but the eyes are bright red, and the ear-lobes, like the comb, face, and wattles, red.

Utility Properties. The Honorary Secretary of the Yokohama Club once assured me that the breed is decidedly useful as well as ornamental, in that he always found the hens really good layers of tinted eggs, and producing a very satisfactory average for the year. The hens, too, sit well and make the best of mothers, being very attentive to their chickens and brooding them until they are well furnished, while the chickens are strong and not much trouble to rear. As table fowls, too, they prove excellent—as they should do, since they are Game—the flesh being of a very fine flavour and there being a good amount of it on the breast, while the skin is thin. Although I have never kept the Yokohama, readers can depend upon the correctness of these particulars concerning utility properties.

Standard Requirements. As can be imagined, plumage is the chief part of this breed for exhibition, viz. the quality and the length of it; and in this respect the tail gets 25 per cent, and the hackles 20 per cent. The cock's neck-hackle must be so long as to come well over his shoulders and back, while his saddle-hackle feathers should be long and narrow, trailing on the ground. There should be a large quantity of side hangers, and these, the tail, and the long sickle feathers, should be narrow and have a ribbon-like appearance. A male bird with a lot of good saddle and side-hanger feathers, even if his sickles be not of great length, looks far more handsome than one having a scanty supply of these feathers but with extra long sickles. Type and condition are also important, 25 per cent, because any Yokohamas which have thick bodies and short backs, and broad but small heads, lack the much-desired and typical pheasant-like form and carriage of the true Long-Tailed Japanese Game fowl. The bird is a slim and elegant one, carrying his tail somewhat low in comparison with other breeds, except, perhaps, the Sumatra Game. Continuing with the scale of points, colour and head get 10 per cent each, because, as in Old Game fowls, colour of plumage is not of much account. Legs and size each get 5 per cent, the former referring to the colour which, again, matters little as long as the legs are not patchy or mottled.

Other Breeds

The foregoing are the breeds of fowl for which standards exist and which have been accepted as pure-bred by the Poultry Club. Most of them are popular for show purposes, while some have been developed commercially for their laying properties. These latter, nevertheless, are not bred to such fine points as the show birds; but, when they are exhibited as utility stock, they generally reach a high standard. Other breeds are seen from time to time at poultry shows; but they are not of sufficient importance to merit detailed descriptions. A few, however, may be briefly mentioned.

The *Araucana*, claimed to be a native of Southern Chili, is said to produce green and blue-shelled eggs. This breed was first brought to the notice of poultry-keepers in 1925, when an attempt was made to popularize it in the United States of America; while during the past two or three years specimens have been exhibited at the Crystal Palace Poultry Show. The birds have the appearance of "barndoors," and they have not appealed to fanciers or utility poultry-keepers in England as worth cultivation. The fowls have feathered ears and are minus a tail, lacking the caudal appendage, which allows the saddle and cushion to fall over behind, and in which respect they resemble the ancient Rumpless or mis-named Manx fowl.

The *Braekel*, an old Belgian breed and considered by some authorities to be a near relative of the Campine as I remarked in my notes on the latter breed, has some admirers in this country, and a specialist club exists for it. The only varieties I have seen are the Gold and the Silver, but I believe that

others, viz. Black, Blue, Chamois, and White, are also in existence in Belgium. The birds are of a hardy constitution, prolific layers of white but rather small eggs, and suitable for the production of milk chickens for the market. The breed is often confused with the Campine, but it is of a somewhat heavier stamp, and is bred quite distinct from the Campine in its native land.

The *Fleche*, an ancient French breed, was once popular in England, but is rarely seen here nowadays. It is a sturdy black-plumaged fowl, and, except that it has a "horn" type of comb, it very closely resembles the Minorca. The hens used to be good layers of large white-shelled eggs. The breed was kept chiefly in Wales, and in the West of England and the Eastern Counties.

The *Ki-Wi*, supposed to be an Australian breed, but which is merely a cross of the Silkie, is a large white fowl which was boomed in America a few years ago as the "Missouri Fluff," and this particular kind was bred from White Plymouth Rocks. It was called the Ki-Wi because its distinctive features were said to be its plumage and its wings—the feathers being fluffy and fuzzy rather than stiff, the feather development somewhat resembling that of an ostrich plume, and its wings being in a rudimentary state only, which prevented it flying. For some reason this fowl was called the "Australian Ki-Wi"; but ki-wi is a Maori word, and the Ki-Wi is a New Zealand flightless bird without a tail. The Ki-Wi fowl, however, is not tailless. I have seen such birds, with long and fuzzy feathering, in breeds as common as the Cochin, the Croad Langshan, and the Orpington, as well as the Plymouth Rock, and in my young days they were exhibited as Apteryx fowls; but they were not without tails, and were also "sports" from a Silkie cross.

The *Naked Neck* fowl is a bird of many names; and it hailed originally from Transylvania. It is a heavy-bodied general-purpose breed, the cocks weighing up to 9 lb. and the hens 7 lb. Young birds are good for table, and the females lay plenty of brown eggs. These fowls, both male and female, are devoid of neck-hackle, their necks being bare except for a tassel of feathers at the back of the comb, and a big tuft of them down the front of the neck and touching the breast plumage, while at the lower part of the neck the feathers form a frill, similar to that of the Condor. The skin of the neck is of a particularly bright red, like the wattle of the common turkey, which, some people declare, gives them a repulsive appearance. For this reason the Naked Neck is said to be very vicious; but I have found it to be as docile as the ordinary domestic hen and to live amicably with other birds. It may be as well to mention that this breed is also known as the Bare Neck, the French Red Neck, the Turkey-Headed fowl, and the Hackleless fowl, and by such American names as "Turken" and "Chirkey"—because, in ignorance, they are said to result from a turkey and fowl cross. As a matter of fact, however, this Transylvania breed is one of the oldest of European fowls.

However, although these five breeds are kept more or less as novelties in England, it would not take many seasons of careful selection to develop them —with the exception of the Araucana—into reasonably good utility stock. Before concluding this chapter it may be as well to mention, for the benefit of the novice who is interested in pure breeds, that fowls are sometimes divided into two classes according to the texture of their plumage, that is, hard-feathered and soft-feathered. The former embraces Aseel, Game (Modern and Old English), Indian Game, Jubilee Game, and Malay. It is also worth noting that Indian and Jubilee Game (although hard-feathered), Sumatra Game, and Phœnix or Yokohamas (Long-Tailed Japanese Game) are not Game fowls for show purposes—the Game being confined to Modern and Old English—while Jubilee (Indian) Game are not eligible for classes provided solely for Indian Game. It has been said that the English are peculiar people; and poultry fanciers are certainly peculiar in the above matter.

CHAPTER X

THE PRODUCTION AND MARKETING OF TABLE FOWLS

IT has been asserted by authorities who make a special study of such subjects that, in the consumption of poultry *per capita* of the population, the people of this country are far behind those of many other countries. Why this should be so is somewhat difficult to understand, because we produce the primest of market birds—there are no fowls to surpass our "Surreys." However, until quite recent years no really serious attempt has been made to educate the buyers in this direction, to stir up a more appreciative appetite for this class of fare among the public generally. There can be no doubt that wider publicity is required with regard to table fowls; and I feel certain, as a large wholesaler remarked quite recently, "The public will eat chicken all right when they know something about it."

I am afraid that, so far, the majority have been too much inclined to regard chickens, ducklings, goslings, and turkeys as luxuries, a sort of choice dish to be served up only on very special occasions. It never seems to occur to the average housewife today to consider poultry as an alternative to the joint, although to a certain extent, perhaps, this may be a matter of comparative market values in housekeeping. And yet, good-class fowls are available at a much cheaper figure than was the case three or four years back—and a good cook, backed by a proficient carver, can make a fowl go a long way. However, in my opinion, this ignoring of poultry as a regular article of diet is very largely a case of habit; some folk are so conservative that their tastes never get beyond beef, mutton, and pork. I am firmly convinced, nevertheless, that very much can be accomplished towards popularizing table birds if producers will give the matter their serious attention; and I contend that the poultry rearer has an excellent prospect of making headway in this direction by a determined effort to bring them before the public. There is room for a vastly increased output of the right class of bird; and, provided it is presented in a tempting manner, there need be no fear of lacking a market. This I know from personal experience, because while I do not specialize in table poultry on an extensive scale, I can always dispose of them at remunerative rates to retailers and consumers.

Admittedly, of late, things are beginning to move in the right direction, because official encouragement is being given to the development of this side of the poultry industry, and better facilities for it are available. Nevertheless, much remains to be done, and to be done by the producer himself. The reader will have gathered from my remarks in Chapter VI that the rearing of chickens, and especially in winter, is not the easiest part of poultry-keeping; but since winter rearing is an essential part of table poultry production, he will see that he can hope to succeed with this branch only when he has acquired a sound knowledge of the technicalities of the work. It is a business which should not be embarked upon in a large way without a thorough course of training. But there is no reason whatever why an intelligent poultry-breeder should not participate in it at some season or other, once he has thoroughly mastered the rearing of chickens.

The Surplus Cockerels

The trouble with table fowls in this country is that their production has not been given the attention it deserves; the vast bulk of producers have concentrated for so long on layers that they do not appear to understand it. And yet, practically everyone who rears fowls to any extent has, at some time, surplus cockerels which have to be disposed of for eating. Probably what every poultry-keeper prefers most of all are pullets; but it is inseparable from all breeding that the percentage of the sexes must be reckoned at least as "fifty-fifty," which means that there are generally as many cockerels as pullets hatched each season.

No matter how great a reputation anyone may have as a breeder of super layers, and how carefully he may breed for stock cockerels, it is too much to expect that the whole of the male birds which he hatches will be of such a high standard as to be sold for stock only; there are always some which have to be discarded. But, omitting altogether these specialist pedigree breeders—who, after all, are not generally classed as producers of table fowls—there are thousands of cottagers, small-holders, and general farmers who almost invariably go in for dual-purpose breeds and crosses; and their surplus cockerels, or the vast majority of them, must be sold for killing. As it is, comparatively few cockerels are required for breeding purposes; and if the demand averages one for every half-dozen hens which are retained for the stock pens, it will be high. On the other hand, many thousands of pullets are kept solely for egg production and no cockerels are run with them. It can be imagined,

therefore, that very large numbers of surplus cockerels are disposed of each season.

When egg production was an especially remunerative business, these cockerels were looked upon as a charge on the debit side. If they were of a good size they were sold alive for what they would fetch, and if the very small sum received for them cleared the cost of their production, the owner was satisfied because, more often than not, they had to be disposed of at a loss. No attempt was made to develop them for table; but if poultry-keepers will take the trouble to send their surplus cockerels to market in a finished state, they will find that what used to be looked upon as a loss can be developed into one of the most profitable sections of their undertaking. More than ever it is necessary to-day to get the best returns for poultry rearing, hence every branch must be so worked as to yield a profit. It is for this reason I suggest that more attention should be given to table birds. Perhaps this is scarcely within the scope of those who aim for the very highest quality in their laying stock, and who go in solely for light and non-sitting breeds; so that few, if any, commercial egg-farmers would feel inclined to attempt it, even with surplus cockerels which they might happen to have on their hands, because they are probably aware that any kind of fowl will not do for the purpose.

It was once suggested to me that Leghorn cockerels have been misunderstood; if rearers would only give them a little attention, there would be no need to "wring the wretched creatures' necks" as soon as they are hatched, because they can be developed for the *petits poussins* trade, and that for such purposes they are specially suitable. My informant assured me that he had obtained as much as 3s. a head for such birds in the early season, when they were six to eight weeks old; and they had been sold without any special feeding or fattening. But I have never succeeded in getting such birds to resemble more than "skin and bone" at such an age; nor have I found any salesmen who would handle them for the *petits poussins* or any other trade. However, for the average poultry-keeper who hatches and rears on a moderate scale, without actually specializing in any particular branch, table poultry production, merely limited to the cockerels from his broods in the ordinary course of events, can be decidedly remunerative.

Suitable Breeds and Crosses

Without making a speciality of it on an extensive scale by employing battery brooders, carry-on pens, and all the other appliances necessary for such work, the rearing of cockerels for table has genuine possibilities; and my own experience in this direction is that, rather than make use of the new method of sexing day-old chicks and discarding the cockerels at once, it is a better proposition with general-purpose breeds to rear them to a marketable age, provided, of course, they are of a breed—or even a cross—which can be grown for the purpose, and, also, that there is ample accommodation for rearing them. I should certainly not attempt to rear Leghorns, or, in fact, any of the light breeds which are in the front rank as layers, for marketing at the usual cockerel stage, simply because there are few male birds of this class which can be developed to the necessary degree of plumpness at an early age, no matter how well they are fed. They are, as a rule, far too energetic on range, and also too nervous in the coops, to put on the requisite quantity of flesh and fat.

It has been said that the commercial egg-farmer can no longer afford to regard his cockerels as a loss, and that he should be able to make a profit, if only a small one, from such birds; but the only opening I can see for him, as he generally specializes in the light breeds, is to attempt to supply the demand for the $2\frac{1}{2}$ lb. chicken, about which we have heard so much of late. Even so, however, I very much doubt if they will meet that demand, simply because that light-weight table chicken, the bird scaling $2\frac{1}{2}$ lb. although of necessity small, must be plump-breasted. I have eaten Leghorn cockerels in their extreme youth—they must be killed for that purpose before they are twelve weeks old, as they put on very little flesh after that age—but the average householder would never think of making a meal of such a bird, because it will not go far with anyone who has a healthy appetite. They are luxuries; and although there is said to be a demand for them, I have yet to find that the returns from Leghorns of such an age, reared solely for table, make it worth one's while to produce them. Much better breeds for the purpose are Bresse, Braekel, Campine, Old English Game, and those of similar stamp; and yet these kinds are of little use for commercial egg-farmers.

However, the question of the most suitable breed for the purpose is not the point for the small producer or the general farmer, since the phase of table poultry with which I am dealing at present is rearing the cockerels which are obtained by those who breed stock for dual purposes and not solely for the supply of chickens for the luxury trade. The birds, therefore, will be of such breeds as Rhode Island Reds, Sussex, Wyandottes, Plymouth Rocks, Old Type Orpingtons, and similar kinds, as well as sex-linked or other crosses, the pullets of which can be depended on for satisfactory egg production. Thousands of such fowls are bred; and thus, year in and year out, there are the surplus males for market. The mistake has been to allow these birds to grow up with the pullets

until they (the cockerels) are of a good size, and then dump them on to the market whenever it has been convenient for the rearer to do so, which has meant that he almost certainly made a loss on them. And yet there is no reason why they should not realize as good a return, in proportion to their age, as do the egg-producers. This is especially the case at the present time; and, in my opinion, the outlook for the future is decidedly encouraging.

Country Chickens

If the poultry-keeper will only give his surplus cockerels proper treatment, he will find them so profitable that he will probably not mind very much whether he hatches out cockerels or pullets. This class of bird is known on the London markets as the country chicken, and there is a steady demand for it; but, although the average rearer will not deem it necessary to send surplus cockerels to those markets —at which the salesmen quite reasonably refuse to handle small consignments—he will generally find it a much more profitable proposition to deal in well-reared country chickens than to attempt the highly-finished "Surrey." The fully fattened and heavy table chicken should never be considered by the small man unless he is making a special business of it, because I am certain that he will reap far better profits in disposing of all surplus cockerels as runners or peckers, or in what is known as the half-fattened stage. Fattening by cramming will come later on, when he has become thoroughly accustomed to table poultry.

Country chickens may be runners or peckers or, on the other hand, half-fattened birds; that is, in neither case are they fully conditioned by a period of cramming. They are sold either off the run without any attempt at fattening or they are trough fed. In no circumstances, however, should the cockerels be permitted to have free range up to the time they are killed for table, because the exercise will make them too muscular and hard fleshed; but if their liberty is restricted for a certain period, they will put on enough weight when fed naturally. A good way to manage them is to select a number of cockerels as near the same age as possible—about three months old—and to put them into an enclosed run by themselves, away from pullets and hens. The partial confinement prevents their running the flesh off their bones, while companionship tempts the appetite, and, as a rule they will agree amicably and not spend their time fighting. When they are at first put into the run they should be kept without food for at least twelve hours—and if ever they appear to be dainty, or do not seem eager for their meals, the fast should be repeated. This will seldom be necessary; and as long as they are happy and hungry they will thrive. As they are intended for sale as runners or peckers they can be fed as usual until a fortnight or more before they are to be marketed, when they can be given nothing but wet mash, as much of it as they can eat twice daily at regular times.

Such birds are often disposed of alive; and some of them are sent to professional fatteners for the final cramming. They can be killed right away, but they are not considered soft enough chickens for roasting. Personally, I prefer to rear the cockerels all along for table; hence, from the time they are off brooder heat and during their life in the enclosed grass runs they are mash fed and seldom get grain. Their diet consists of dry mash until they are twelve weeks old, with an occasional meal of boiled wheat (almost cold) as the last one of the day. They then get as much wet mash as they will eat in about a quarter of an hour thrice daily at regular times, the mash being prepared with milk instead of water. A mixture of 21 lb. finely-ground English barley meal, 14 lb. each white maize meal and best middlings, and $3\frac{1}{2}$ lb. high-grade meat meal will increase their weight and fatten the cockerels sufficiently to enable them to be well dressed when killed. Birds such as they, scaling around 4 lb. each, can always be disposed of to consumers at prices which are not exorbitant and yet leave a workable margin of profit for the producer.

Breast Meat All-important

I find that there is nothing like the prejudice against yellow-skinned fowls nowadays that there was when the hotel and restaurant people, in London at any rate, used to insist that the public preferred white-fleshed fowls with white legs. The consumer is beginning to realize that the colour of the skin and shanks has really nothing to do with the quality of the flesh; which, as producers are aware, is perfectly true. Hence, while in England we do not go in for the golden skin so much favoured in certain markets in America, the producer who caters for the large family trade in the country need have no fear of his birds being unsaleable simply because they have not white skin and legs.

As a matter of fact, except for the London trade, it matters little what colour the skin is, provided the bird is plump and tastily presented. What counts are the quality and texture of the flesh; these are the points which tell with consumers in general. Moreover, there are comparatively few fowls to-day, even of the so-called yellow-skinned breeds like the Plymouth Rocks, Rhode Island Reds, and Wyandottes, whose skin is yellow enough to be noticeable; and that is why the average poultry-keeper stands a good chance of disposing of his surplus cockerels at re-

munerative prices. Provided they are not fed solely or largely with yellow maize and maize meal, they can be dressed to please the eye and ensure repeat orders when sold direct to consumers. Let him aim for quality, by turning out the fowls in the best possible manner.

In my experience the great thing is to condition the surplus cockerels with a view to their having a good appearance, and to dispose of them while they are still young. It is a great mistake to keep the birds for such a length of time that they gain weight of carcass but lose actual flesh. There must be plenty of breast meat without an undue proportion of bone and frame to flesh. The maximum amount of breast meat, in truth, is all-important to-day. The birds to avoid are those which are high in the breastbone because, even at 4 lb., they present a lean appearance; and such fowls, although white-fleshed, never look tempting, no matter how skilfully they may be dressed or trussed. Admittedly, table chickens are now sold by weight; but they must have plenty of meat on them if anything is to be made from their sale. Large, coarse cockerels never meet with a ready sale in my district; at any rate, such fowls are not favoured by retailers, while they are certainly not the kind to send out to consumers as representing one's efforts at table poultry production.

Taken generally, there is, undoubtedly, room for improvement in the output, not so much in numbers as in quality; the producer should pay particular attention to the quality of the birds in which he deals, since it will pay him much better than turning out second or lower grade chickens. We, as producers, must rear the birds well, and then finish them in the best possible manner. They must be specially treated from the time they are off brooder heat until they are ripe for killing. The sexes can be brought along together, the cockerels with the pullets, and given their liberty as long as the chickens have to be brooded; but when the broody hens are taken away or, in artificial rearing, the foster-mothers are dispensed with, the cockerels must have their quarters quite distinct from the pullets, so that they can be given different rations. This early separation is beneficial for the rearing of chickens for most purposes; but it is certainly essential when dealing with table birds. Cockerels which are brought up with pullets from the shell furnish up at too early an age; and while this is sometimes advantageous with light breeds for show purposes, it is detrimental for market chickens, simply because it makes the flesh of the bird hard and gives the cockerel a "cocky" and, therefore, old appearance.

By all means keep the sexes separately as soon as the chickens are of an age to fend for themselves; and, if possible, let the cockerels be well out of sight of the pullets. Such isolation as this I find beneficial in enabling the male birds to settle down amicably; and they must be a contented flock, otherwise they will not progress in a satisfactory manner. This is a point the novice should particularly note, because any quarrelling among the cockerels will prevent their developing flesh and subsequently putting on fat; and that applies whether they are being kept in coops or crates, or allowed their liberty. Moreover, chickens which are being reared for the table should be kept reasonably quiet; and by this I mean that care should be taken to prevent cats, dogs, rats, or other animals disturbing them, while the attendant himself should do nothing that is likely to make them nervous in any way or to scatter at meal times. These may appear to be trivial matters, but their observance is well repaid in the steady progress of the birds.

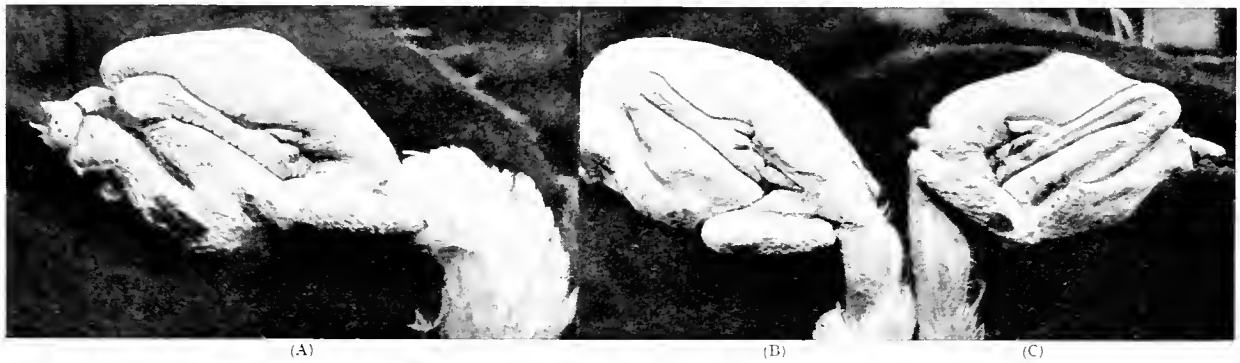


FIG. 185. SUSSEX TABLE CHICKENS

The above illustrations indicate the bone formation required for the highest-priced light-weight Sussex table chickens. *A* and *B* have well-rounded and curved breastbones; *C* has an upstanding breastbone. *A* weighed 3 lb. 12 oz.; *B* (a pullet) 4 lb. 4 oz.; and *C* 3 lb. 7 oz., but the last-named, with its faulty breastbone, is ugly and would fetch a much less price than the others. These photographs were submitted by the Sussex Poultry Club to, and approved by, high marketing authorities

Feeding and Housing

Sometimes I give the cockerels their final fortnight in a fattening pen or crate. This is easily made and costs little for materials; and a pen 3 ft. long, 1 ft. 3 in. deep and 1 ft. 6 in. high will be large enough for half a dozen birds. They do not want room in which to walk about; indeed, the closer they are the better, as long as they can all stand to eat at the same time. Unless the crate is to be used outside it could be made entirely of bars; but otherwise only the front and floor should be slatted, while it must be watertight. It is necessary that the inmates are not allowed to see fowls at liberty; so if the pen cannot be fixed away from the usual run, it is advisable to hang a sack over the front of it, and—as it will be 3 ft. to 4 ft. from the ground for the convenience of the attendant——to run some wire-netting around the bottom to prevent birds getting under it. Here should be placed three or four shovelfuls of loose earth, sawdust, or similar material for the droppings, which should be removed at the end of the period.

The food may be as previously mentioned, but with boiled potatoes added up to 20 per cent by weight. It can be prepared with sour milk or with water; but in the latter case add about 5 per cent of rendered fat. Make it in the form of pulp, somewhat similar to the food prepared for a fat pig, but so that it will not run off a board—about 1 pint of liquor to a quart of meal. A trough must be used for feeding, and one that fits closely to the bars; let it be from 7 in. to 9 in. wide, so that the birds cannot put their beaks over the other side of the trough and waste much of the food. The mash should never be hot, because if fowls have hot meal their skin is very apt to tear when they are being plucked. They should take three meals *per diem*, the first soon after daybreak and the others at regular intervals; and each meal should be as much as, but no more than, they can eat cleanly in about half an hour. Rather give it to them in two or three portions at first than put so much in the trough at one time that they will not clear it, because on no account should food be allowed to remain from one meal until the next. As it is, the trough should be removed and scraped fairly dry as each meal is finished. A fortnight of such treatment should be sufficient to plump the cockerels; but keep an eye on them, because if any should refuse to eat put it aside for immediate killing.

So far I have dealt with the surplus cockerels from one's own hatches; and if they are managed in the manner indicated they will scarcely fail to find a ready market. It is taken for granted that the pullets will be reared for egg production; but any which are not required for such a purpose—as, for instance, those which are discarded by the expert handler—could well be fed off for table, because pullets of six to seven months old make good roasters. Still, it would scarcely pay the producer to run pullets on to such an age simply for table purposes.

As regards housing, some poultry-keepers imagine that table chickens should not be permitted to perch because of the fear of the birds developing crooked breastbone, which, admittedly, does detract from the appearance of the fowl, and, moreover, lowers its price. Possibly, with such a diet as I have suggested, perching might have a prejudicial effect on the keel-bone; but my table cockerels are accommodated in Sussex night arks or in slatted floor houses, and I rarely get one with such a defect.

In this connexion the folding system might answer until the chickens are ready to be cooped for the final fortnight of feeding, or even right through the period. It has been suggested to me as the ideal way of rearing fowls for table; but, so far, I have not given it a thorough trial for that purpose. It is useful for growers, when one can be assured of the fold pen being moved to a fresh patch of ground daily, although it affords no shelter for the birds during rough weather. Still, as I say, the system may be worth a trial, if one is at all cramped for room. It will be necessary, of course, to prevent other birds getting at or worrying the occupants of the fold; but the system may possibly enable the enclosed run—which, in any case, would be set aside for the table birds—to carry more stock, and it would certainly keep the birds to small units. Nevertheless, when one has the plant suitable for the object in view, one hesitates to discard it and go to the expense of refitting with that which might not prove in the least advantageous. I cannot say that I am in favour of producing table poultry on factory lines; and yet I find that it takes less labour and time to attend to a brood of 100 table chickens which are accommodated in a Sussex night ark or a slatted floor house than a similar number of youngsters kept in four folding pens which have to be moved daily.

Day-old Chicks

With the establishment of hatcheries in this country, and particularly since the advent of the sexing of day-old chicks, more cockerels than ever are available, because not all commercial egg-farmers who adopt the latest method of sexing their chicks kill the cockerels at the day-old stage. It is possible, therefore, to obtain only cockerels from these hatcheries for the greater part of the year, and at very reasonable prices. It must not be imagined, though, that all breeds handled at these hatcheries are suitable for table because, since the greatest demand is for pullets

for egg production, it can be readily understood that the most popular kinds of layers are dealt with at them. Up to the present I have not heard of any at which pure breeds or first crosses are hatched specially for the supply of market chickens; and, as a rule, the nearest that can be got to them are the cockerels of the dual-purpose breeds, or crosses of such breeds, which latter are mostly the result of sex-linked birds. But, when a speciality is made of table poultry and, obviously, the bulk of one's produce has to be disposed of through market salesmen, it is necessary to exercise great care in the selection of stock birds for the breeding pens, if the most is to be made of the business.

It is a mistake to imagine that, because the chickens have to be killed at an early age, any sort of stock will do to produce them. When the aim is to get into the best markets, the breeds must be chosen with as much care as is taken when layers are required. I have already dealt with the subject of mating in Chapter IV, so there is no need to treat of it here; but I would stress the importance of breeding for the maximum breast meat, no matter what class of chicken is being handled. It is most advisable to study the buyers' requirements and to cater for that demand; and if white-fleshed birds are wanted, and they are the kind for which the market salesman pays the best prices, by all means let him have them. It may not be necessary to keep pure breeds, because there are some very reliable crosses, and among them may be mentioned Indian Game-Light Sussex, Faverolles-Light Sussex, Faverolles-White Wyandotte, and Light Sussex-White Wyandotte, in each case the male bird being of the first-named breed.

It has been said that the Indian Game male bird results in excessive infertility; but this should not be so if a vigorous six to eight month old cockerel is used, and one which has been rough-reared. The first-named cross, a sex-linked union, is an excellent one where large chickens are required, and it is almost equal to the Indian Game-Dorking, which used to be so much in vogue in my early days when prime fatted "Surreys" were in demand for the very best trade. The more recent Jubilee Indian Game is also a good cockerel to cross with Sussex hens for the production of big chickens. The Faverolles-Light Sussex and the Faverolles-White Wyandotte are rather quicker growers, the latter being especially suitable for the production of small birds, although some of the progeny have yellow legs. The Sussex cross produces white-fleshed chickens and those which plump well at around 4 lb. The Light Sussex-White Wyandotte chickens are white-fleshed and white-legged, and they grow well. There is, of course, an advantage in a white-plumaged fowl—and the Light Sussex is such—in that there is no trouble about black stubs; hence the bird dresses white.

The chief point to note when selecting stock of the dual-purpose kinds for the breeding pen is to avoid any birds which have prominent or "bladey" breastbones. This may not matter so much if their chickens are for development into big birds; but for killing young, up to the 4 lb. stage, the breastbone would be too noticeable to give the bird a plump and finished appearance. As I have mentioned in the preceding chapter, there are plenty of pure breeds which can be utilized for the production of market birds, and among them some which are classified as light kinds. When the crossing of two pure breeds is resorted to—and first crosses have the advantage of being hardy, as well as fairly quick growers—it is generally advisable to do so with birds of the heavy or dual-purpose class (the sitters) on both the male and the female sides; but in any case, when light and heavy breeds are crossed, the stock male should be of the former and the hens of the latter kind, as, for example, a Bresse cockerel with Sussex hens.

Fattening by Cramming

So much for the uncrammed chickens, the birds which are conditioned by trough feeding only, that is, by getting mash regularly for the last fortnight or three weeks before killing, and in which matter no hard-and-fast rule can be laid down. It is safe to continue feeding them as long as they are eager for their mash; but as soon as they begin to slacken off they must be marketed, because if they are kept on they go out of condition and rapidly lose weight. Such fowls as these, which generally finish around 4 lb., are in good demand at most times of the year; and even though they are classed as country chickens, it is seldom difficult to place them, and at remunerative prices. The other class of bird, the table chicken known as the "Surrey," is a different proposition, as it is the fully fattened fowl, trough-fed and crammed. It is highly skilled work that the average poultry-farmer would probably not indulge in; but although the demand for this super-fatted bird is limited, it must not be imagined that cramming is not profitable, because fatteners in the Heathfield district of Sussex make their living solely from conditioning chickens by cramming. In these expert hands, as much as 1 lb. can be added to a cockerel in ten days, while the weights of pullets can be increased by at least ½ lb. in a similar period.

Moreover, well-crammed chickens have been known to make up to 25 per cent better prices per pound in the markets, even in these days of small purses. Undoubtedly cramming is the most skilful part of fattening; and by its means the expert can turn out birds up to 8 lb. as soft and tender as the best 4 lb. chicken. To be successful at it, however, one must have a thorough training and the necessary experi-

ence; and it is by no means an amateur's job. I got a good experience of it in my young days; and yet during recent times it has been found that, without actually specializing in table poultry production, well-prepared uncrammed chickens yield a satisfactory return for the average poultry-farmer, and particularly in country districts. That is certainly my experience to-day. What is known as the "Surrey" perfectly healthy. The professional fatteners purchase runners for the purpose; and I have seen birds from all parts of the country in the pens at different times. As a rule they are put into coops arranged in single tiers along the inner sides of large, roomy sheds; but on some up-to-date establishments these fattening coops are made in two or three tiers. For quick handling, however, I prefer the old-fashioned single-tier

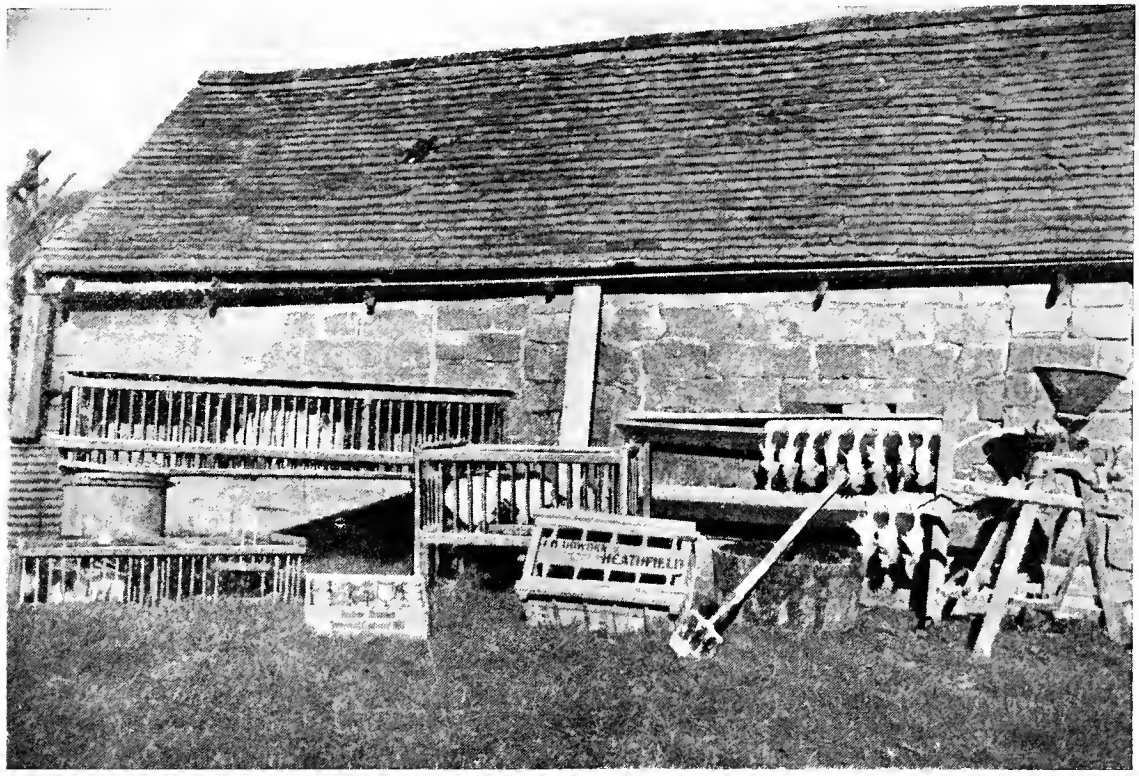


FIG. 186. TABLE FOWLS

Various appliances used in the Sussex fattening industry. On the left a three-compartment fattening coop to hold eighteen birds, next to it a killing crate (on legs) and below it a carrying crate. The cramming machine is on the right, and next to it a press or shaping trough with fattened White Leghorn cockerels, also a tub in which the mash is mixed. Tilted against it is a ped or crate used for packing the dead birds for transport to the London market. Photo by John H. Dowden & Son, Heathfield

chicken is for a trade which is more or less limited, and which at present will scarcely allow for a great deal of expansion because the bird is a luxury. The poultry-farmer need not, therefore, consider birds of this super-fatted kind; but he who specializes in table chickens should have some knowledge of the work connected with it, if merely to be able to turn out such fowls should the necessity arise.

Particular care must be taken in selecting the chickens for cramming, because they will have to be caged for a much longer time than is required for trough feeding. They must be white-fleshed and white-legged; and, because of the close confinement to which they will have to be subjected, they must be pens, fixed about 3 ft. from the ground, and divided by lath partitions into compartments about $2\frac{1}{2}$ ft. long. They are generally 18 in. deep and a similar height, and each accommodates not more than half a dozen birds. The top, the bottom, and the front of these coops are made of slats. Those forming the bottom are fixed from end to end, not from front to back, the tops of the slats being slightly rounded and the sides planed so that the bottom of each is not as wide as the top, which permits the floor to be fairly free of droppings. They are placed an inch or more apart, but the front bars have a 3 in. space between them to allow the fowls easy access to the food trough, while a couple of these bars in each compartment are made to act as the door.

Suitable Coops

Similar coops are built for outdoor use in summer; but the tops are boarded and made to slope from the front to the back, while adequate protection is afforded the fowls in inclement weather by means of sacking hung in front, the ends and back of the pens, of course, being solid. The inmates must on no account see birds at liberty; hence, when they are being fattened in the open the pens must be in a fairly secluded place. A V-shaped trough is fixed along the whole front practically at floor level; and the birds are fed regularly from these troughs twice daily, although when they are put in they are generally fasted for twenty-four hours before the first meal, to sharpen their appetites. This is a matter which must be watched, however, because they must not be kept so hungry that they become unduly restless and start feather picking or comb pecking.

They should not have more than two meals daily, and the food should be given at regular times, with as long an interval as possible between them. The quantity should be as much as they will eat steadily in about half an hour; but food must not be left in front of them after that time, the troughs being removed and scraped clean. These birds do not require drinking water, because the mash should be of the consistency of paste, or thick cream. The morning meal should be supplied almost at sunrise and the second one an hour before dusk. When feeding the fowls the attendant should pass along the front of the coops twice or thrice, putting a small quantity of food in the troughs each time, because in this way the birds will be induced to eat more than if the whole ration were put before them at once. It is advisable to prepare the mash at least twelve hours before it is required; and when I was fattening on a fairly large scale this was always one of the evening tasks.

Until oats became so expensive it was customary to give the birds nothing but genuine Sussex-ground oats; and while this is undoubtedly the best now—provided the oats are stone-ground from plump grain and not merely a mixture of cut oats and husk—for the production of the best quality chickens, other rations have had to be used as a change, if not solely as a substitute. Such mixtures as fifty-fifty (always by weight) of Sussex-ground oats and sound English barley meal, or similar proportions of oats and maize meal (this latter white and never yellow), or barley meal and maize meal are to be recommended, these latter two particularly during winter and early spring. Another very good mixture is barley meal and ground wheat, with boiled potatoes as one-third of the total weight of the meal mixture. Mix the meal with an equal quantity, or rather more, of sour separated milk for preference; or use less than 10 per cent of dry skim milk if liquid milk is not available at a low rate. In this latter case prepare the mash with boiling water.

FIG. 187. FATTENING FOWLS

A section of the fattening plant at an Essex establishment. As will be seen the cages are out of doors, and the fowls are being trough-fed

Preparing the Mash

The great thing is to have the mash perfectly smooth by constant stirring; and this requires practice. I always allow maize meal to soak alone, and give it plenty of time in which to soften and swell. The Sussex-ground oats and barley meal are also stirred well into a cream before the two are blended; and if necessary more milk or water is added. I take as much care over the fatteners' mash as I exercise when mixing groats for gruel or cocoa in the cup prior to adding the boiling milk—and I never make either of these with water. When potatoes form part of the mash they are boiled in their skins, being previously scrubbed free of dirt, but not boiled until they burst through. Put them into cold water, bring it to the boil, and then allow it to simmer until the potatoes are soft enough to be broken down. When ready, drain them—if they have not been cooked in a cage—break down quickly and blend them with the already mixed meals. If this mixture, containing potatoes, is given at the commencement of fattening, super middlings (weatings) can be worked into it at the rate of one-sixth of the total weight of the meal mixture. No matter what mash is used it should be allowed to ferment; but just prior to putting it into the trough it must be well stirred.

The length of time during which the chickens can be trough-fed in this way cannot be fixed; and it is this which calls for special attention. In some cases it may not exceed a week, but in others it is possible to continue it for two or even three weeks. There are occasions on which little if any progress is made during the first few days; but as long as the birds take their food readily let them have it from the troughs. When they cease to come up to it with an appetite commence cramming them. On an average, ten days will be long enough for trough feeding. Well-reared chickens, those which have been specially fed for table from the time they are off brooder heat until they are twelve to fourteen weeks old, give little trouble; and they can be brought along on the dry mash and grain system. It was once thought that dry-mash-fed chickens were unsuitable for cramming, or indeed for fattening; but a better understanding of feeding has proved this to be a fallacy. In this case, however, the birds should have one meal *per diem* of wet mash—in addition to their grain and dry mash—for ten days to a fortnight immediately before they are put up for fattening in the pens. Trouble may arise when runners have been brought in for finishing, on account of the uncertainty of the manner in which they have been grown; but anyone thoroughly accustomed to handling live table chickens will know whether or not the birds are fit to be put up for fattening.

There can be no doubt that finishing by cramming puts the hall-mark on table fowls; so whenever it can be managed, and the demand warrants it, the birds should be crammed. Cramming does not mean merely the addition of layers of fat; it must be combined with a good proportion of flesh. The action of fat is to soften and ripen the flesh; and therein lies its value. The flesh of a crammed fowl is more easily digested than that of a runner, although the latter may be fully flavoured and of good enough texture for anyone with a healthy appetite. The difference between birds of these two classes is that in the one the water in the muscle and tissue evaporates during cooking, leaving the flesh firm, whereas in the other the fat melts and therefore softens the flesh. This is well known to a connoisseur; consequently, a completely finished, i.e. crammed, chicken commands a higher market value than a half-fattened one, even though the latter may carry as much breast meat and a fair amount of fat. Let me repeat, however, that the cramming of fowls is not everyone's job; it goes beyond trough feeding, which does not require a great amount of skill if the feeder pays attention to detail.

Machine Feeding

Cramming is not work that should be attempted by inexperienced hands, because one must be a thoroughly competent feeder to make a success of it. Professional crammers are difficult to obtain outside Surrey and Sussex; and to become proficient at the work means close study, the great thing being to know just when the birds have reached the limit of their improvement. On a large establishment the crammer has to work hard. As a rule fowls may safely be crammed for ten days, but the expert at it can generally keep his birds "on the machine" for three weeks or even a month, the chickens increasing in weight all the time. The food for the fowls undergoing the process can be of the same mixtures as those mentioned above, except that potatoes and middlings should not enter into it, while for preference Sussex-ground oats should be the only meal used.

It can be prepared with full milk, although if separated milk be used, as much as 10 per cent of boiled mutton fat can be added; or properly prepared dripping from hard mutton fat (such as trimmings of the loins) should be mixed with the food, thus replacing the fatty matter removed in the cream. The use of coarse brown fat—usually half tallow—will not only upset the birds but result in badly coloured flesh. Trimmings and lumps of white fat should be melted by boiling, or "rendered" and clarified, the liquor being carefully run off into clean receptacles and allowed to cool, and in which it will be kept

sweet for a considerable time and is ready for use in a few seconds. Some crammers use up to 1 oz. a head *per diem* of this fat, beginning with ¼ oz. and gradually working up to the maximum.

While on the question of food, it is as well for me to caution the beginner against the use of ordinary ground maize or Indian corn. This grain contains a large percentage of yellow oil, which, accumulating under the skin, gives the birds the appearance of being yellow-fleshed; and this detracts considerably from the value of crammed chickens, which must be white. Special care is required also in preparing the mash; it must be entirely free of lumps, scarcely as firm as sausage meat, and yet not loose enough to run off a board. The old type of Sussex crammer, hand-worked and requiring the assistance of a youth to operate it, is now rarely if ever used. The up-to-date cramming machine—and there are two thoroughly reliable makes of it on the market—is a light contrivance, which the attendant can wheel along in front of the pens as each section of birds is finished with; but, often enough, the expert crammer gets an assistant to handle the chickens from and to the cages. Before beginning operations it is essential to avoid air spaces when filling the container by pouring the meal carefully into the hopper, and then to work the treadle once or twice to ensure smooth running of the mash. The outside surface of the india-rubber tube should be kept moistened by the operator occasionally dipping a hand in water and rubbing it over the tube.

The fowls must be crammed regularly twice a day, and with an interval of twelve hours between the meals, so that no food will remain in the crop from the previous meal. This means at least one meal by artificial light in winter, generally given in the evening; and, the birds being at that time of the year kept indoors for fattening, it is a good plan to have a lantern dimly burning from sundown until the second meal is over. A most important point is to see that the fatteners are penned in a quiet place and in semi-darkness, at a moderately warm and uniform temperature, and free from draughts of cold air. At no time of the day should they be exposed to a brilliant light; and on no account should they be allowed to get chilled. When penning chickens for cramming I almost invariably put them into batches of six, by sectioning the long rows of pens as already described; and I always had the end section empty. Thus, as the work of cramming proceeded, each lot of birds was put into the section just vacated.

Until one gets into the way of it, cramming is a tedious process, because the fowls must be carefully handled from and to the cages, and while they are being fed. It never does to drag them out or to throw them in, since they must be kept as quiet as possible. To cram a bird, remove it from the pen, face forward, and by using both hands; do not pull it out by its leg or wing. Make sure, by feeling its crop, that it is ready for a meal, as it should be after an interval of twelve hours. Then proceed as follows: Hold its body firmly under your left arm so that it cannot flutter, and keep its head in your left hand. Open its mouth with your right hand and slip the forefinger

FIG. 188. THE CRAMMING MACHINE IN USE

The tube, which is inserted into the fowl's mouth, must reach the bird's crop ere food is pumped into that organ by the downward pressure of the operator's foot

of your left hand into it to hold the tongue down. Take the india-rubber tube, attached to the container, in your right hand and quickly insert the end of the tube into the bird's mouth, change its head to your right hand, place your left on its breast and crop, draw the neck gently out to its full extent and push it along the tube until the end reaches the crop—some three inches or so. At this moment place your foot on the treadle and press it gently down, thus forcing the food from the cylinder into the fowl's crop. If, after one pressure, the crop is filled—which can be ascertained by your left hand—gently release the treadle (keeping your foot on it all the time) and withdraw the bird from the tube.

The necessary amount of food for each chicken can be learnt only from experience; but the plunger can be adjusted to ensure a full crop with one downward

pressure. Care is required, as can be imagined; but, although from this minute description the operation appears to be somewhat tedious, "practice makes perfect"; and with the assistance of a youth to hand the birds from the pens, the expert crammer can feed 100 chickens in half an hour. The beginner at cramming should follow that ancient advice and "make haste slowly." Probably at first he will find that a dozen birds will be as many as he can manage in the half-hour, because the difficulties will be in holding

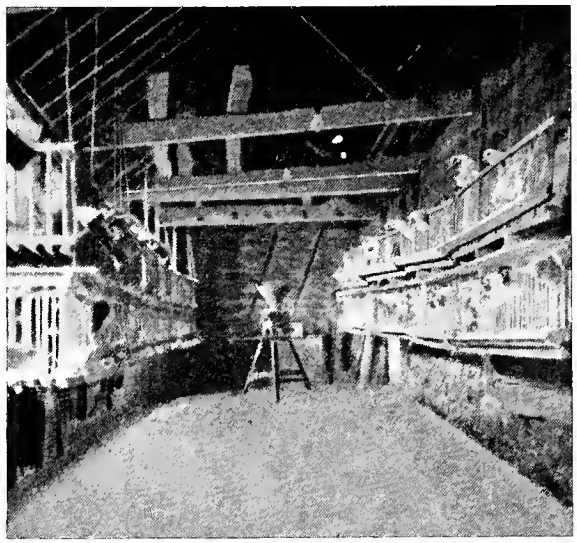


FIG. 189. FATTENING COOPS
Part of a fattening shed at a Heathfield poultry farm, with a cramming machine in the background

the chicken firmly, keeping its tongue down, and passing the tube into the crop. As a rule fowls which have been partially fattened by trough feeding in the pens take the cramming quite naturally; they show no aversion to it, and rarely does one sicken under the process.

Killing Fowls for Market

There are several ways of killing fowls, but the method generally adopted in this country is by dislocation of the neck; and it has the great merit of being quick, clean, and humane when properly carried out. Moreover, it is not difficult to learn, although it calls for a certain amount of skill and care. Salesmen are quick to detect faulty killing methods, simply by the discoloration of the skin. In some cases, as, for instance, when the birds are intended for cold storage, they are killed by sticking or palating. But no matter which method is adopted, all poultry which has to be marketed for table must be kept without food—or anything likely to be eaten by them—for twenty-four hours before they are killed, so that nothing shall be left in the crop or gizzard, and to ensure the whole of the intestines being empty.

Fasting is essential for two or three reasons. If food be allowed to remain in the crop, or partially-digested food in other parts of the body after death, it is much more liable to set up fermentation and putrefaction than the flesh itself; and such decomposition taints the carcass and spoils its eating qualities. Many good specimens have been spoilt by neglect of this precaution, turning green in front of the keel-bone and in the abdominal cavity, or around the vent after they had been killed a day. Discoloration such as this, and also that which follows a bruise, is detrimental to market birds. Moreover, with fasting, the flesh keeps very much sweeter, and longer; it makes better eating, is much firmer, not so tough, and less liable to stringiness. That is the business end of the matter, and one very good reason for the birds being properly fasted.

Let me disabuse the reader's mind of there being the least cruelty in it, because a well-fed fowl can live for a considerably longer time than twenty-four hours on its own reserves without any inconvenience. I recall an instance of an ordinary farmyard hen which existed for some weeks without food or water, owing to her misfortune in falling between two haystacks, unknown to her owner, and being unable to liberate herself; but when she was discovered, treatment restored her to her normal health, she lived for a long time afterwards, and eventually died of old age. However, those of us who draw fowls for trussing —which, admittedly, is not done with those intended for market—know that the internal organs of a properly starved bird are very much easier to remove than those of a full one, as they are dry and inoffensive, while in the other case they are moist and slippery, very apt to get torn, and altogether most unpleasant to handle.

Dislocating the Neck

Now, as regards killing by dislocation of the neck, it is not difficult to learn, although it is best not attempted until one has had a lesson or two from an expert. There should be no mawkish sentiment about it, and it should be done in a humane way. The actual operation is as follows: Hold the fowl by both legs in your left hand, catching its tail and the longest feathers of its wings in the same hand. Then, with your right hand, grasp its neck as closely as possible to its head, the back of the bird being upwards; extend the neck by a steady pull downwards, and immediately bend its head sharply back or out, so that the neck will be dislocated—no bones are broken—destroying the joint between the top of the spine and the skull, and pulling the head out of its

socket. This leaves a small cavity; but an extra pull may be necessary to form a gap of about two fingers between head and neck and thus leave space into which the blood can drain and form a clot.

The carcass must not be put on the ground, but either suspended by one foot to allow the wings full play or kept with the head hanging down in order to enable the blood to drain to the "pouch" caused by the break in the vertical column. This draining is of the utmost importance. When dislocating the neck there is no necessity to use "brute force"; in fact, to do so will tear the skin, and it may very easily result in the bird's head leaving its body. Take a firm grip and give a steady pull, bending the head sharply back when the neck is fully extended. Do not attempt it at the end of a strenuous day. Killing should not be undertaken by a beginner without careful practical instruction; but the work can be easily and quickly done after a little experience, and it is just a matter of a second or two between life and death. Plucking should be started immediately, while the body is still warm, because the feathers will then come out more easily than if the bird is left to get cool.

Fourteen to fifteen years ago, when I was giving one of my lectures and demonstrations on the killing and preparing of fowls for the table, the secretary of The Council of Justice to Animals handed me a pamphlet on "The Humane Killing of Poultry," the chief object of that council being the promotion of humane methods of slaughtering animals used for food. Two ways of killing were advocated in that pamphlet. The first was to hold the bird in the left hand, as already described; and then "taking careful aim, give a very sharp rap at the back of the head with the edge of a flat piece of heavy wood about 16 in. long, starting the blow not too high above the bird, so as to avoid risking a miss. The blow will produce instant unconsciousness; the throat should then be cut, suspending the bird head downwards, and full bleeding will follow. The spot for hitting fowls is just behind the comb. For a beginner it is a very good plan to follow up the first blow with a second one, as rapidly as possible." Fowls held up in such a way remain quiet, and the head projects from the body, so the target should be an easy one to hit.

The second way of killing suggested by that council was to cut off the bird's head with a rather heavy chopper. Thus: "One person holds the bird by its legs, wings and breast, placing its head and neck sideways on a block, its eyes away from the operator. The head should be severed at the joint between the skull and the spine. The spot can be made sure of by feeling through the feathers. The chopper must be sharp, so as to cut through the feathers, which might otherwise prevent the head being properly severed. When about to strike, take careful aim and do not raise the chopper high." I have tried both of these ways of killing fowls, but, candidly, I much prefer simple dislocation of the neck as I have described, because it is quicker, cleaner, and not a whit less humane than stunning or beheading. Moreover, I

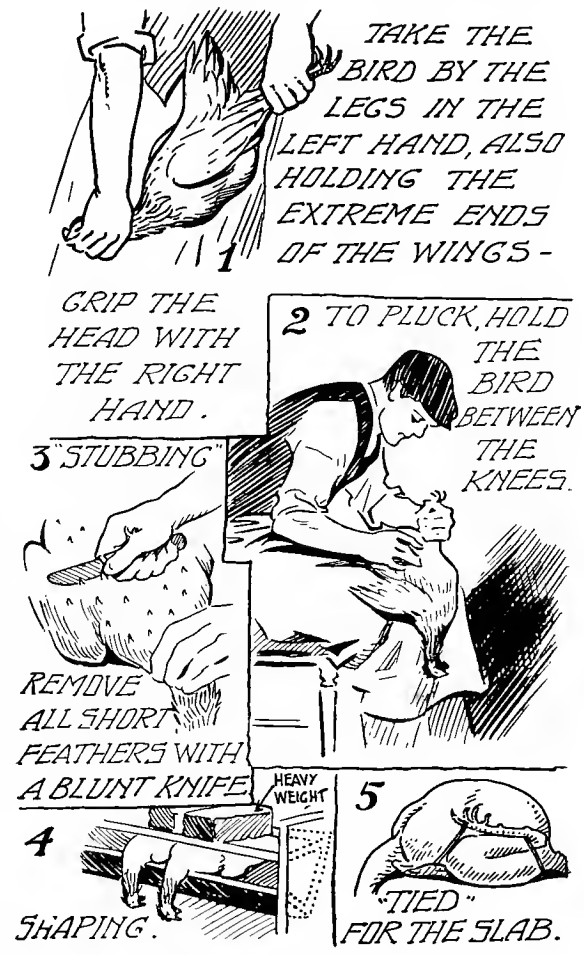


FIG. 190. KILLING, PLUCKING, AND SHAPING FOWLS

1. Killing by dislocation of the neck
2. Rough plucking while seated
3. Stubbing, to give the carcass a finished appearance
4. Shaping, necessary for the best markets
5. Tying, useful for retail trade

find that beginners become proficient at it much sooner.

The latest humane killer I have used reminds one somewhat of a guillotine, although it is neither fitted with a knife blade nor does it decapitate the bird. It is a small cast-iron instrument with a back plate which must be screwed securely to a heavy bench or a stout post at a convenient height—sufficiently high (or low) to allow the operator to exert pressure on the lever. The bird should be held by its legs, etc., in the

left hand in the usual way, but with its neck in the groove at the spot mentioned in connexion with beheading. A swing over of the lever with the right hand, and a firm press downwards, should destroy the joint of the spine and the skull, without breaking the skin; and the cavity thus made should be increased to allow the blood to drain into it.

"Palating"

Yet another way of killing chickens for table—and one which is generally adopted by salesmen on whose premises the birds are killed and plucked—is known as "palating," and also termed "sticking and debraining." This is much more complicated in its details than dislocation of the neck, although just as effective when thoroughly performed. It is said to improve the appearance of the birds and their keeping qualities, while it assists considerably in dry picking. The operator severs the nerve centres and makes the feathers loosen themselves. It is in vogue in North America; and so expert are some Canadian slaughterers at it that a fowl can be killed and plucked in less than four minutes—the record is held by a butcher who, at a public competition, did the whole process in 2 minutes 12 seconds. Such a time included taking the bird from the crate, debraining it, removing all the feathers and stubs, and leaving the carcass finished and quite clean.

Briefly described, the operation consists of stringing the chicken at a convenient height, holding its head firmly in one hand, and by means of a very sharp and pointed knife in the other, severing the jugular vein and piercing the brain. One has to be very skilful and experienced to kill chickens by this method, because, as an American authority once said of it, "Its success depends on getting the right bleed and the correct stick." As a matter of fact, the operation to be successful requires the greatest skill; and while it can be performed correctly and expeditiously by those who are acquainted with the anatomy of the skull and are expert with the knife, it is certainly not the method of killing which should be attempted until one has had a few practical lessons from a specialist. In this respect it is advantageous for the intending operator to procure the head and neck of a dead bird so that he can make a close study of them and learn how to perform the operation painlessly. It will assist him considerably if the skin be stripped off the top of the head and neck, and then the skull sawn through longitudinally, as he will see the brain and how to pierce it. He might also try out all the moves on a dead bird or two.

However, I will endeavour to explain the operation in detail; and for the purpose one requires a very sharp jack knife and some strong cord. I have a special poultry-killing clasp knife (made by a well-known firm, and which I obtained about thirty years ago) with a couple of blades, one of which is fairly narrow and has a double cutting edge at its end, while the other blade is broad, turned at the end and particularly sharp. Either can be used, but I find the narrow one better for palating. To get the chicken into position for killing, some men hold it between their knees while they are sitting, but it is preferable to suspend the bird from a beam by its legs, letting it come down to a convenient height, say on a level with one's elbow. It can be thus hung by one length of cord around both legs or by using one length for each leg, the latter being more convenient when one wishes to stand to do the plucking, and especially if the cords are 18 in. or so apart. In either case—as also when the fowl is held between one's knees—its wings should be locked, that is, crossed on the back of the bird and interlocked at the second joint, since this prevents movement. The chicken's breast must face the operator; and its head must be firmly held in his left hand, his thumb passing over its right eye and ear along the right side of the throat, his fingers pressing on its head and the left side of its throat.

Now open the bird's mouth with the thumb and forefinger (left hand), insert the blade and pass it well back into the throat, turning it towards the roof of the bird's mouth with the point touching the skin inside the throat towards the left ear. Replace the thumb and forefinger to their first position, keeping the knife in the same angle of the jaw, then exert pressure and sever the large artery in the left side of the throat. Withdraw the knife and allow the blood to flow freely for a second or two before the fowl is stuck. Now, with the back of the blade uppermost, and touching the point of the upper beak, insert the point of the knife into the groove in the roof of the mouth and push it straight into the skull directly back of the eyes, the bird being immediately rendered unconscious as soon as the base of the brain is struck. There will be a violent muscular contraction when the brain is pierced; so, to paralyse the nerves completely, give the knife half a turn each way and withdraw it. It is this paralysing of the nerves which loosens the feathers.

De-braining

A variation of this consists of piercing the brain from the outside. For this purpose some poultrymen place the bird on its back, while others prefer to hang it by its legs, using a soft, thick cord, and having its back against a wall. The operator then proceeds as follows: Hold the head firmly against the wall with the left hand, having the thumb over the top of the

skull across the eyes; depress the head somewhat, so as to curve the top part of the neck, and then, with the nail of the index finger of the right hand, feel for the joint between the skull bone and the first bone of the neck; in the middle line will be found a depression. With a sharp pointed knife (the French poultry-killing knife is about the best) in the right hand, still holding the bird's head firmly with the left, thrust the blade through the depression between the skull and first bone of the neck into the brain, directing the point of the knife just above the level of the eyes, about a quarter of an inch under the left thumb. Then make a slight side movement of the knife to break up the brain. To bleed the bird, withdraw the knife from the skull, but not from the opening in the skin, push the blade across the neck, keeping the blade close to the bone, then cut outwards, but not through the skin; the chief artery will be severed. Do the same on the other side of the neck. Hold the head of the bird the whole time; the blood will flow through one opening in the skin. There will be more or less muscular movement, but the consciousness of the bird will be destroyed at the first thrust of the knife.

The whole operation in expert hands is over in very much less time than it has taken me to describe it; but, while this method of killing is claimed to be humane—as probably it is—I greatly prefer to dislocate a fowl's neck in the usual way. Bleeding allows the blood to drain thoroughly from the carcass, and, of course, it enables the chicken to be cold-stored with safety, while palating permits of the speedy removal of the feathers—they can be almost rubbed off. Nevertheless, the Ministry of Agriculture recommends that the home producer would be well advised to continue the practice of killing by dislocating the neck. And with that advice I entirely agree, because, considered commercially, it is sound. Bleeding means the loss of all the blood; and since there is approximately 1 lb. of blood from three chickens, the loss of weight—and cash—on a full crate of birds when prices are high makes a considerable difference to the producer. Still, in this matter, one has to study the demands of the particular salesman with whom one is dealing, although I never now bleed any poultry which is sold from my farm.

Some poultry-keepers practise bleeding the fowl under the influence of chloroform, which, by paralysing the inhibitory nerves of the heart, keeps the heart beating, and thus aids the hæmorrhage until complete anæmia is produced, when death immediately occurs. Any chloroform remaining in the system would tend to preserve the flesh of the fowl, and would be completely driven off by the heat of cooking it. A common method in vogue with taxidermists, when killing small birds, is to stop the heart's action. The subject is held in the left hand, while with the right the bird is grasped round the heart, and this is pressed with the finger and thumb so as to stop its beating. The bird is held still for a second or two, and then dies without a struggle. For fowls it requires both hands, one round the breast and the other round the neck, just below the wings, to grasp firmly, so as to stop the heart's action. This method is advocated by some as being the best, as the bird loses no part of its properties; but when death is caused by this process the flesh has a dark colour, which is unpleasant.

It must be acknowledged, however, that the method most adopted in this country, that of dislocating the neck, is beyond doubt the cleanest and most humane way. When the throats are cut or the birds are bled, the flesh is beautifully white, but the meat is often dry and suggestive of deal sawdust. The sight of the blood and the mess it makes are very objectionable. A well-known old poultryman who has killed thousands of fowls does so in no other way than by taking the fowl by the legs, and with a small piece of iron or any other heavy article striking the bird sharply across the back of its head. This dislocates the neck, and death is almost instantaneous. As he explained to me, if the neck were not dislocated by the blow it would be an easy matter to dislocate it while the fowl was insensible to pain, as the blow would certainly stun it. Let me just add a few words of warning before concluding this particular subject, namely, that very young boys should not be entrusted with the killing of poultry; and the same applies to people of mature years who are known to be careless or clumsy. Birds should never be handled roughly or in such a way as to cause needless discomfort or fright. Moreover, from another point of view altogether, a bruise will readily show when a chicken is plucked.

Dressing Table Fowls for Sale

Dressing fowls which are offered for sale in the market or at a retail shop includes plucking and shaping or tying them. The birds are not drawn and trussed, although some salesmen suggest they should be "roped" in warm weather; but this should not be necessary if the chickens have been properly fasted before killing, and any residue in the intestines is carefully squeezed out through the *cloaca* after plucking. Some poultrymen let their birds have salt water to drink during the fasting period, while others give them a dose of Epsom salts after twelve hours, to cleanse the intestines; but, although this treatment may be beneficial for runners or peckers which have not been trough-fed or crammed and are cooped merely for fasting, I have never found it necessary

otherwise, the semi-liquid food being digested and the residue passed from the system by the end of the twenty-four hours' fast. Neither have I had occasion of recent years to "rope" table fowls—a process I describe later in this chapter—and there should be no need to do so, if the carcasses are properly cooled before they are packed for market. Mention of salt water reminds me that when old fowls are being prepared for home use, a good practice is to give each of them a teaspoonful of vinegar in the food supplied to them on the last two days, as it has a beneficial effect on the flesh.

Poultry should be plucked the instant they are killed, as the feathers are much more easily removed while the body is still warm. If for some reason such immediate plucking cannot be managed, then it is advisable to let the bird hang until it is quite cold, because if plucking be attempted while it is in a lukewarm condition the skin is more liable to tear. It is risky, though, to allow the feathers to remain on a chicken for any length of time in hot weather, if merely because the body then takes a very considerable time in which to cool and the flesh of it may be spoilt. Moreover, it is more likely to attract flies, at the stern, under the wings, and around the head. When plucking fowls I sometimes suspend them by their feet and stand for the work but generally I sit while doing it; and in this latter case I am careful to see that the bird's head is kept hanging down, so that the blood can drain into the cavity of the neck.

When a chicken is killed in the usual way, by dislocation of its neck, there is muscular movement for some considerable time after death; and if it were hung on a post by its feet—poultry should never be put on the ground immediately they are killed—its wings would flap jerkily and its whole body be convulsed. Now, a quick plucker will finish his task, or almost finish it, before muscular action ceases; but the novice must not imagine that this movement is a sign of the bird being in pain, because when the neck is dislocated the nerve centres cease to function and pain is annulled. This muscular reaction is much less apparent when the chicken is killed by bleeding and palating and there is certainly not sufficient movement of its limbs to prevent the plucker getting to work on the bird as it hangs from the beam. When plucking poultry which have been killed in the ordinary way, the novice will find it better to sit than to stand, holding the bird on his lap—he should certainly don an overall apron for the work—with its breast uppermost, its body sloping slightly downwards, and its head and neck hanging over. Its legs and wings should be grasped together in the left hand and pulled back, so as to keep the skin fairly tight, which does much to minimize the risk of tearing; and if he can also manage to hold the skin with his left thumb while drawing the feathers from the breast and back it will further facilitate matters.

Dry-picking Dead Birds

It is advisable to rough-pick the breast and body feathers first, then those of the thighs, part of the neck and the small feathers of the wings, follow with the back and the remainder of the neck, and finish with the large (quill) feathers of the wings, and the tail. Always remove the greater bulk of the feathers before attempting to clean off the small and fluffy ones; and never pull too many feathers at one time, otherwise the skin will probably come away with them and the appearance of the bird will be spoilt. It is as well for me to caution the novice that tearing is most likely to occur on each side of the keel-bone, where there is almost invariably a layer of fat, on the shoulders, on the saddle or cushion (that part of the fowl's back near "the parson's nose"), and on the neck.

As I suggest elsewhere, "Make haste slowly." Plucking may appear to the beginner to be a very simple matter; but speed and efficiency are acquired only after considerable practice. There is quite a knack in plucking—ruffle the plumage and pluck the feathers away from you, the opposite way to their natural position. I use the thumb and forefinger (second joint) of my right hand for pulling them, keep them close to the skin—which is kept fairly taut by holding the legs and wings as suggested—and never attempt to pull out a big bunch. Two or three at a time will be enough for the novice. He will do well to remember the fat "fillets" of the breast, and the tenderness of the skin on the saddle and shoulders; let him tackle them slowly, and perhaps pull each feather out separately.

When plucking the neck leave the last inch or so of feathers near the head—more if the bird has been killed in the usual way than when it is bled and stuck. When plucking the legs hold each up, in turn, by the shank and then the feathers will easily come away—the legs are, in fact, the simplest parts of the bird to pick. Tail feathers, those of the wings known as the flights, as well as the feathers of the finger and thumb of the wing, are often difficult to draw out, but they can generally be managed by a sharp tug backwards. It is always advisable for beginners to practise on old fowls before tackling chickens; but in any case it is wise to proceed slowly at first. A skilled plucker can rough-pick a bird in less than a minute; few amateurs can do so in less than half an hour.

Those who pluck fowls which have been killed by palating, following bleeding, make short work of it. Commencing at the stern, one sharp pull will remove

the whole of the tail, the body being held firmly over "the parson's nose" and the feathers grasped at their base. The wings are then stripped of their quill feathers, each wing in turn being gripped in one hand and those stiff feathers removed by two pulls. Next, with both hands, the fingers being bent, the breast and neck are "raked" down; and if the bird has been properly palated the feathers will almost drop out. After clearing the breast and neck, the plucker works on the legs, the under-part of each wing, and finishes with the back. The feathers from these birds are pulled off in handfuls, not merely half a dozen or so at a time, hence the quickness with which it is accomplished. All chickens which are killed in this way with the knife are not always so easily plucked, because everything depends on the "stick," and the slightest slip in this direction will mean that the chicken has to be plucked in the usual fashion. The first pull of the tail will indicate whether all is right or wrong; if the feathers do not come out easily with that first pull, the nerve centre has not been correctly destroyed, and this means that the bird cannot be plucked more easily than one which has had its neck dislocated.

Stubbing and Singeing

When plucking chickens I have a tub or a box in front of me, and into it I place the bulk of the soft feathers—some do fall by the way, as it were—the flights, tail and other stiff feathers being cast aside. Needless to say, plucking should be done out of draughts, and, too, in a place set aside for the purpose, because, while stray feathers can be swept up, it is impossible to collect the fluff which floats about and settles everywhere. The average poultry-keeper will find it advisable to don dungaree overalls, vest and trousers in one, an old coat and a cap, and keep them specially for the work.

After being plucked the bird should be stubbed, if necessary, while the body is still warm, and then singed, the *cloaca* being cleared as already mentioned, prior to singeing. Stubbing is not skilled work, and it can be entrusted to a boy or a girl; in the fattening districts it is generally undertaken by girls and paid for at a penny a bird—small enough, one might think, and yet good money can be earned at it when large numbers of chickens are being handled. The stubs are the very short or pin feathers found on chickens which are changing their plumage, or in older birds which are beginning to moult. They cannot be removed by the fingers only—and it is particularly essential that they are not left in a bird with coloured plumage—so a short blunt-pointed penknife or a stubbing knife has to be used with one thumb to assist. The blade must be passed under each stub, and the feather gripped with the thumb and pulled out sharply. A young friend of mine uses tweezers for the purpose, and although it is a more tedious task it produces an excellent finish.

When stubbing is completed, and the *cloaca* has been cleared, the bird should be singed to remove the hairs from the carcass, these hairs being filoplumes, slender feathers with no vanes. Singeing must be very carefully done to avoid scorching or blackening the skin. It was once usual to singe a chicken by passing it through the flame from a heap of dry clean straw well alight, holding the carcass by the feet in one hand and the head in the other and passing it quickly through the flame twice or thrice, turning it over while doing so, to reach every part of the body. This very ancient method is still in vogue in some parts of the country; but a much more expeditious way is to use a blow lamp, or singe by means of a methylated spirit flame. I prefer the lamp, holding the chicken by one foot in my left hand and the lamp in my right at a sufficient distance to prevent scorching or blackening; it is then done in a second, and with one twist around of the carcass. If the skin gets marked in any way—or slightly torn when being plucked—it can be dusted with flour or fine oatmeal, which improves its appearance, but never misses the eye of a keen market salesman.

When many birds have to be killed on one day see that the biggest are the first to be done, since they require a longer time in which to cool; and all chickens should be allowed to get cold before they are packed for a journey, otherwise they are apt to turn green in transit. This is especially so during hot or muggy weather, for which reason fowls for table should not be killed on a damp or sultry day if it can possibly be avoided.

Scalding the Carcass

In connexion with plucking, two ways of doing this are practised in America, one by scalding and the other by "dry-picking," which latter I have just explained. There is no doubt that when properly done, scalding enables one the better to pluck the birds—particularly if they are not exactly spring chickens—while it also adds to their appearance. Young fowls should never be scalded, since nothing is gained by it, and much may be lost. To get the best results care must be exercised; the water should be just at the boiling point, but not actually boiling, before the fowls are immersed, and the operator must hold the bird by its head and legs, and lift it up and down in the water three or four times for about half a minute. The feathers and stubs must then be carefully removed without breaking or tearing the skin. The bird, after being thoroughly plucked can then be "plumped" by dipping it for about a couple of

seconds in hot water—just under boiling point—and then putting it into cool water (of the natural temperature) where it should be allowed to remain for fifteen to twenty minutes. Of course, the legs should be cleaned; and ten minutes after the bird is killed its abdomen and *cloaca* should be squeezed so that all excrement is removed. The great point in the "plumping" is to see that the scalding water is of uniform temperature.

There is less loss in dressed weights when a bird is scalded than when dry-picked, since the body absorbs a small quantity of water in the process of plumping; but, on the other hand, one has to be very careful in the scalding so as not to alter the natural appearance of the skin and give it a decided tint. If the water be too hot (or the bird be immersed for too long a time) the skin will be partly cooked, and the scarf skin will peel off and thus the flesh will become discoloured. On the other hand, if the water is not hot enough, it is a difficult matter to remove the feathers without tearing the skin. The bird is suspended by its legs for plucking; and when the feathers are off and the body is singed, it is plunged into cold water to cool the carcass. Dry-picking, however, although requiring more skill and taking more time to complete—except when palating has been the method of killing—is decidedly superior, because birds so plucked are more attractive and, in the English markets, they realize better prices.

Tying Down and Shaping Birds

Having completed plucking in the English way, the bird is put into the press or tied down into shape, the latter being the general one for private trade, and the former method that which is adopted for the London markets. Cooling and pressing (or shaping in a trough) or tying are done at the same time; and at least four hours are required for cooling in the usual way. A brick building, a cellar, or a dairy is an ideal place for the purpose; and although there is no cellar in my farm, there are suitable brick buildings and an excellent dairy, facing east and open also to the north. This latter makes a perfect cooling room, and there is no trouble in getting table chickens to be cold enough to pack, in less than four hours. Some producers neither tie down nor press their birds, but simply fix their legs and wings into position, so that when they cool off the carcasses keep compact. The cooling in this case is a simple matter, as the birds are put on a slab in a cool place where the air can circulate around them; and they are covered with a damp cloth.

Proper tying down, however, a simple enough process, or even pressing in a trough—which also requires no skill—is much preferable, the latter particularly so, because it has the result of the fowls assuming a broader and more substantial appearance; and even Leghorn cockerels can be improved by pressing. Although it can scarcely be said to be the custom in this country for poultry producers to sell table fowls direct to the public from shop counters or market stalls, many dispose of them direct to retailers—poulterers, fishmongers, butchers, game and provision dealers—while others supply them, untrussed,

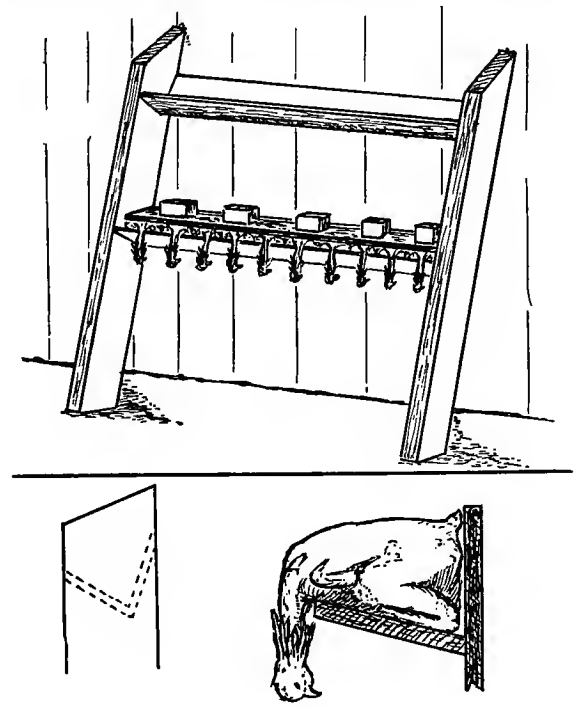


FIG. 191. SHAPING TABLE FOWLS

A two-tier press or shaping trough, with fowls under the weights. Below, end section of trough showing angle, and fowl in the trough, with wings folded and legs in position

to consumers. In either case, it should be the aim to present the birds in the very best possible manner; no poultry should be sent out in a rough and unfinished state. In some districts table fowls are neither tied down nor trough-pressed but merely hung by their feet—the position in which they are allowed to cool off. In my opinion it is a mistake, since if they were shaped in some way, the carcasses would present a much more tempting appearance when displayed for sale.

Fowls are almost invariably trough-pressed for the best markets, but most country birds are simply tied down. This latter is a very simple process, although it may appear difficult when described in cold print. This form of shaping is known, in some localities, as "trussing for the slab," and occasionally it is done by means of skewers instead of string; but string enables one to give the carcass a much more present-

able appearance. The bird, however, is not "trussed" in the poultryological sense—trussing means that it is drawn and made ready for cooking. When commencing to tie down a fowl—which, as well as pressing, must be done immediately the plucking, stubbing, and singeing process is completed, and while the flesh is still warm—place it on a bench or a table on its back and press its legs down to the sides of its breast and also backward; pass a piece of string around the hocks (at the base of the breastbone), cross it under them and secure it around the tail, the knot being on top of "the parson's nose." Now take two pieces of string, each about 6 in. long, make a slip-knot in each and catch up the toes of one foot in it, turn the fowl on its stern, pass the strings behind each wing and tie them securely across the back. This brings the whole breast of the bird into prominence, and shows the carcass off to advantage.

I generally snick the longest toe of each foot about half-way through (on the sole) and almost at the ball, which severs the tendon and allows the toe to be pulled well down, while I always fold the wings back. If the tying down has been properly done it makes a remarkable difference in the appearance of a lean bird. Some poultrymen use only two pieces of string for the whole process, carrying them along the back (after fixing the front), over, or rather around, the tail, and knotted at one side. It has the same effect in the end; it gives the best possible appearance to the bird, while a chicken so prepared is easy to handle and convenient for packing for market or displaying on the stall.

Although I do not advocate the use of skewers, either for preparing a fowl for the counter or when actually trussing it for cooking, the practice is in vogue in some parts of the country. When using skewers take up the wing above the first joint, pierce through the thigh near the joint and run the skewer across the back, taking up the other leg and wing in a similar manner. Now fold back the wings, and, bringing the bird's head around to the rear, run a short skewer through its nostrils and the end of the back just near the tail. The legs must be secured with this skewer or tied together at the hocks. Yet another way is to twist the neck of the fowl (prior to skewering the front completely) under one wing, so as to bring the head at one side of the breast. Thus, when the bird is displayed on its back the head is seen with the beak forward.

Trough Pressing

Of course, in the case of fowls from the famous fattening centres of the south-eastern counties, the birds known as "Surreys," this tying down or skewering is not practised, because, as they are specially fed and crammed, they are shaped in a press, or a "shaping trough." That shaping in this manner improves the look of the bird cannot be denied; but —and this is a most important point—it must carry a good amount of fat, fore and aft one might say, to ensure the actual shaping being successful. All that is required is a trough made of two very short boards, the front one about 5 in. wide and the back 6 in., and joined together at rather less than a right angle. It is customary to fix these troughs in three tiers to hold thirty to thirty-six birds. Directly the fowl is plucked let it be shaped. I have seen skilful fatteners press the fat and flesh upwards to the breast, with their fingers. It requires great care and some force; but they manage it without breaking the skin or discolouring it in any way, and it certainly improves the shape and appearance of the bird when cold, since it permits of the front being full and smooth. However, one has to be well up to the work to make a success of that part of shaping.

In the ordinary way, tie the bird's hocks loosely together and press the legs and feet in at either side of the breast; then put it into the trough back up, tucking the wings closely to the sides, pressing the body well in and against the back board, and allowing the head and neck to hang over the front. Commence at one end of the trough, and press the birds closely together; when the trough is full, place a loose board —4 in. to 5 in. wide, and well smoothed down, and the length of the trough—on the backs of the fowls just behind their shoulders, put some heavy weights on top —hard old bricks will do, since they do not powder or break easily—and allow the fowls to remain for about four hours until they are quite cold. Old-fashioned as is this method of shaping fowls, it answers well and sets them to that "squat" type demanded on the London markets, which is a vast improvement on the lean and lanky-looking birds one too frequently sees, which have not even been tied down.

Roping Dead Birds

I have mentioned the "roping" of table fowls. During very hot, muggy weather or when thunder is about, it may be advisable to "rope" the chickens if they are not required for immediate trussing for the table or they have to be sent to a distant market. It is done to prevent the birds turning green; and yet it should not be necessary if they have been properly fasted before killing and there is available a thoroughly cool place in which to keep them. However, it certainly facilitates cooling; and although it naturally reduces their weight to a small extent, it is better than having to discard the carcass altogether as unfit for sale. It means the removal of the whole of the intestines from the vent to the gizzard, and they have to

be withdrawn through the *cloaca* with the finger, or through a small incision made at its side for the purpose. It is by no means easy to accomplish, especially if there be much fat at the stern; and great care must be taken to avoid rupturing any part of the gut.

Opinions differ among producers and dealers as to whether "roping" is necessary or not. I have never had occasion to resort to it, because I maintain that proper fasting—combined with care in seeing that anything remaining in the intestines when the fowl is killed is squeezed out through the *cloaca* immediately after the plucking—and the thorough cooling of the carcass obviate "roping." But if I were asked to submit the birds to it, I should not hesitate to do so, provided the purchaser was prepared to pay for the loss of weight which it entails. This loss, like the loss of weight when chickens are bled, amounts to very little on a single bird; but wholesalers, as well as retailers, do not accept table poultry singly, so it means a considerable loss on a consignment.

Cooling, of course, plays a most important part in the preparation of table poultry for market, but seldom outside the fattening centres of the south-eastern counties is adequate provision made for it. The birds must be cooled while they are being shaped; hence it should be done in a scrupulously clean place, and in air cold enough to prevent flies getting at the carcasses. Even though the weather be mild, there should be no necessity for incurring the expense of ice, because, as I have already mentioned, if a damp cloth be placed over the birds and they are stored in a cool room where the air circulates, it will produce the desired effect. However, they must be completely cooled before they are packed.

Drawing, Trussing and Deboning Fowls

I have just dealt with dressing fowls for sale, which is as far as the producer need go when they have to be sent to markets, or to retail shops in one's locality. Some fowls are further dressed, in that their breastbone is broken down; but this is one of the little tricks of the trade to deceive the innocent customer. I once read the following explanation of it in one of the trade journals—

"Why do you break the breastbone?" asks an irate customer who is also the carver. "We do not break it, madam. The killer does that; he knows that if we were to display the bird without the breaking down the public would not buy. Be it ever so good otherwise, a crooked-breasted bird would not sell, and so he hammers or presses the bone into the flesh to make it appear round or plump. We are not our own masters, unfortunately; the public demand is for the appearance of the breast, and that ends it. That the legs are scraggy, that the condition of the bird is otherwise than first-class, is no matter; the public is entitled to its own opinion, and what we say or think is secondary always."

That, as I say, is the opinion of someone in the trade; but the public does not require table chickens which have been faked in such a way. Birds which have been so lacking in stamina as to develop crooked breastbones are not in the soundest flesh to be eaten, and they should not, therefore, be marketed. The salesmen must be their own masters, because I have yet to meet one who would pay as much for such imperfect specimens as for those with straight breastbones. No matter how much they may dress the former, the demand for a plump appearance of the breast is for natural plumpness and not for that which is produced by a trick. Producers will be wise in their own interests to keep faulty fowls for the home table, because to market them is not likely to increase the demand among the public for table poultry.

However, there is another form of dressing at which those who go in for table poultry production should become expert, and particularly if they have a good private trade and deal directly with consumers, either locally or through the post—and a considerable postal business can be obtained by a little judicious advertising—and that is, drawing and trussing, both part of one operation, namely, the preparation of poultry for cooking. At any rate, I find it is decidedly advantageous to deliver chickens, fat young fowls and even old hens, trussed in such ways that they are ready for the oven or the stew pan. This operation of drawing and trussing—removing the internal organs from the carcass and fixing the bird up in a convenient form for the carver—has generally been left to the cook, although most retailers will undertake it just before delivering the bird to the customer. But producers who retail their fowls direct to consumers are well advised to make themselves conversant with every means of supplying the birds in the most convenient form; and not the least is that of trussing a fowl on the most approved legitimate lines.

A well-trussed chicken has a decidedly better appearance than one which has been badly dressed; and let it be understood that the actual trussing does not add one iota to the flesh of the bird, since it merely permits of its being presented with the best possible appearance. When properly done, it considerably improves the look of the carcass, and that is all it should do. There is only one way of drawing a fowl, but there are several ways of trussing it, although some are apt to give the bird a false appearance; and this is especially so with the style frequently adopted by retailers, whereby the whole skin is loosened—"skinning up," as it is termed. But let me describe

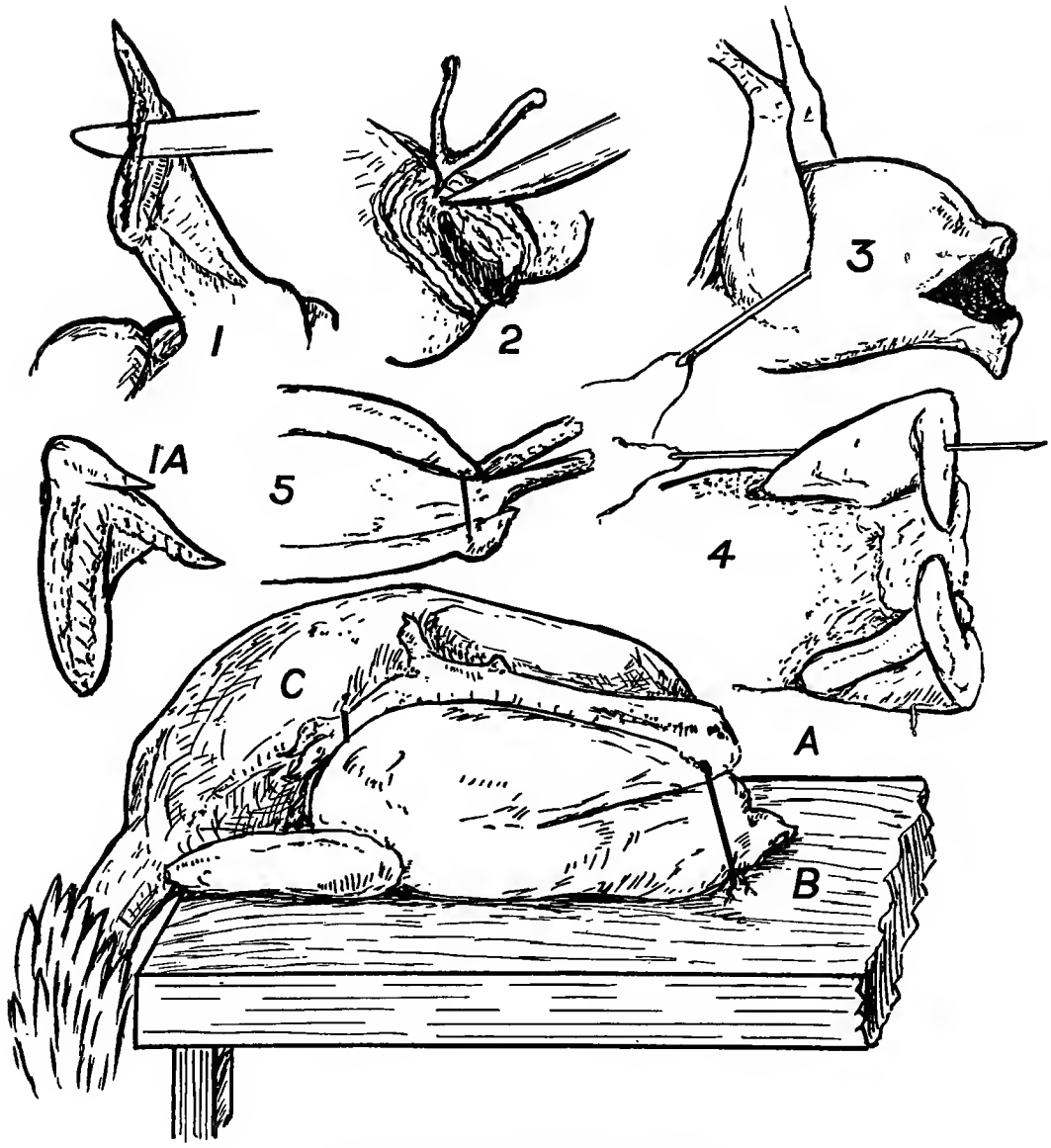


FIG. 192. TYING AND TRUSSING A FOWL

A fowl tied for the slab; *A*, *B* the string which secures the hocks and the tail-piece, and *C* that which is tied around the extreme ends of the toes and brought over the bird's back

At Top. 1, trimming the pinion, the knife inserted to remove the loose skin; 1*a*, the extreme and second joints of a wing, showing the loose skin to be trimmed off, also the finger and the thumb, which should be removed at their extreme joints; 2, scraping out and removing the merrythought or wish-bone; it is into the opening shown that the operator's finger should be inserted for loosening the lungs, etc.; 3, the carcass cleared of its contents, the legs pressed towards the neck, and the trussing needle being inserted behind the right thigh; 4, the trussing needle passed through the left wing, the wings being folded and the skin of the breast stretched over the back; 5, the legs secured to the tail-piece

the methods I adopt, and which give such satisfaction that there is no lack of customers for table fowls. The articles necessary for drawing and trussing are a stout and sharp knife with a straight and fixed blade and a pointed end; an 8 in. or 12 in. trussing needle—not a long and double pointed "packer," which some people mistake for a trussing needle, but which is an extremely dangerous instrument to handle; strong but thin white string; a clean cloth; a firm bench; a cutting-up board; a wooden skewer; and a basin.

Removing the Internal Organs

All things being at hand proceed as follows: Nick the skin of each leg through to the bone, just below the knee, and at the back of the shank; or if the bird be an old one remove the sinews by gently cutting the

skin of the shank all round—half-way between the knee and the foot—and down the back of it towards the toes (to expose the sinews), then pull out one at a time, by inserting a wooden skewer under each, giving the skewer a twist round, and pulling steadily, holding the thigh of the bird in the other hand. When expert at it, the whole of the sinews can be drawn at once.

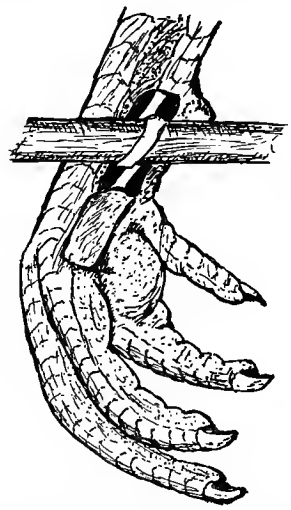


FIG. 193. REMOVING THE SINEWS

A simple way to remove the sinews from a fowl's leg is to open part of the inner skin, near the foot, insert a wooden skewer (pointed), catch up one sinew at a time, and give it a twist, then pull the sinew from the thigh—it cannot be pulled from the foot. When all are free, cut them away (near the ball of the foot) and replace the skin. This will enable the trusser to leave the feet on, trimming off only the end joint of each toe

Next place the bird on its breast with its stern towards you; and with thumb and forefinger of your left hand pull the skin of the neck towards the head until it is tight, then cut across—an inch or more from the carcass—making this incision between your left hand and the trunk of the fowl. This gapes open; and by loosening the skin and drawing it slightly back over the body, the junction of the neck can be distinctly seen in the form of a small indentation. If the point of the knife be inserted into that cavity, pressed through, and given a slight twist, the neck will be completely severed; but since this is apt to prevent the subsequent folding of the wings to balance the bird, I prefer to cut through the first joint of the neck bone, half an inch or so from the body.

Care must be taken not to press the knife beyond the opposite side of the bone, otherwise the crop and the flesh of the breast may be damaged. The bone being severed, loosen the skin by peeling it up the neck towards the head, and complete the cut made when the neck was first opened; sufficient skin must be left to enable its being drawn well over the back and to permit of the front of the fowl being stuffed, if necessary. When this much is completed—and provided the bird has been properly fasted prior to killing—the crop and part of the windpipe should be released by the fingers and cut out. In some cases the crop so firmly adheres to the flesh that it is difficult to remove, while in very fat chickens patience is required to get it away entirely. It is located on the right side as a rule, and can generally be distinguished by its almost transparent appearance. Pull it out as far as possible, and cut the alimentary canal low down.

Now reverse the carcass by putting it on its back, and, having folded the skin up to expose the breast meat, press your thumb firmly down the inverted V-shaped cavity, to break the membrane and open the front. Then, with the palm of the right hand uppermost pass your middle finger into the body at the top of the cavity and loosen all internal organs which can be reached; work the finger well around the interior, and release the lungs—a somewhat difficult matter at first, but quite simple after a little practice. They adhere, one on each side, to the backbone near the shoulders and in cavities; but if the finger be inserted at the top of the front opening and worked against the ribs of the bird (from the left), the left lung can be felt at the bottom before the backbone is reached; keep the finger going, and the lung will be lifted out of its cavity, that is, thoroughly loosened, so that when the finger is withdrawn, again inserted at the top of the front opening and worked around the right side in a similar manner, the other lung can be loosened.

Then, if it be desirable to remove the merrythought or wish-bone—and its removal does facilitate carving—turn back the skin almost to the shoulders, gently scrape the flesh from the top edge of the bone (and particularly where the two prongs of it join), insert the knife under the bone at each side, cut the ends from the flesh, turn the bone back towards the stern of the bird, and it should now be taken out whole. Next, stand the fowl on its chest, make an incision lengthwise between the vent and the end (posterior) of the keel-bone, insert a finger, pass it around the intestine, pull out a loop (often referred to as the "trail"), which hold in a finger of the left hand, and very carefully cut around the vent without damaging the intestine. Place the bird on its back, with its stern to the right, and, passing two or three fingers into its body, gently but firmly loosen everything that can be felt. If the loosening of the front and rear be properly accomplished, practically the whole of the interior of the carcass—i.e. the gizzard, heart, liver (both lobes), lungs and other organs, except the kidney—can be drawn through the open stern, in one mass.

Should the bird be extra fat at the stern, rolling the body a little under the hand before drawing out the contents will simplify matters, while rubbing one's fingers in salt will prevent their slipping. Great care must be taken not to puncture any part, particularly the gall bladder. If the latter happen—and it is quite likely to occur until the operator is adept at drawing out—it is apt to impart an unpleasant flavour to the flesh; but this can be obviated by soaking the carcass, for about half an hour, in cold water in which a handful of soda has been dissolved. It is customary with some people who draw poultry to run cold water through the body, with the object, no doubt, of ensuring its being clean; but this is not desirable, and all that need be done is to wipe around the interior with a dry and clean cloth.

One thing to note, especially when trussing a thoroughly "ripe," well-fattened fowl, is to remove the oil gland; otherwise in cooking it is likely to spoil the flavour of the bird. This gland finishes with a wart-like protuberance on the top of the tail piece, or "parson's nose." It should be cut down through the centre, its contents carefully squeezed out, and then cut off level with the back. If particularly full, the cavity could be swabbed out with a 10 per cent solution of hydrogen peroxide.

Stringing and Skewering

However, to continue with the preparation for cooking; the waste parts having been removed and set aside for the time being, the bird must be trussed. In this connexion there is a difference according to whether it is required to be served roasted or boiled and whether strings or skewers are used. Presuming, therefore, that it is being prepared with string for the oven, proceed as follows: Fold the wings over the neck by turning them in on the back in the form of triangles, and with their tip or "finger" pushed over the first joint, from the "elbow" to the shoulder. Thread the needle, and, keeping the carcass on the cutting-up board with keel-bone uppermost, grasp both legs in the left hand and push them down, then over towards the front to tighten the skin; insert the needle behind the fleshy part of the leg as low down as possible, push it through, and pass it out at the corresponding place on the opposite side. Then put it into the fleshy part of the wing, slightly underneath but as near the elbow as possible, and pass it out through the end joint near the "wrist"—the natural "openings" between the wing-bone can be easily ascertained with the point of the needle—then over the back, securing the breast skin and thus closing the front, and through the other wing the reverse way. Draw the string together tightly, knot securely, and cut the ends, which finishes the front of the bird and keeps the wings in position.

When it is customary to stuff the breast with force meat or sausage, the string should be passed through both wings in the same way so that it can be tied in a bow over the neck of the carcass, therefore permitting the cook to loosen it up for the desired purpose. Many people serve force meat balls with roast

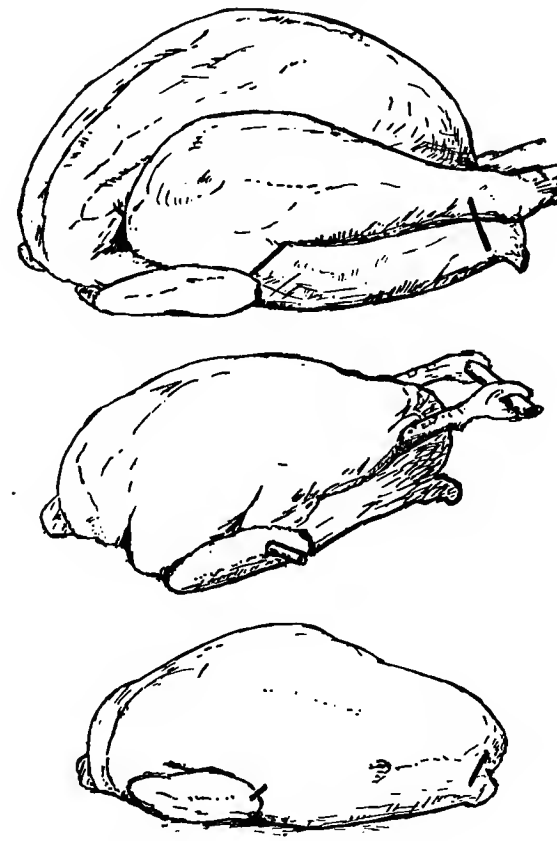


FIG. 194. TRUSSED FOWLS

Top. Trussed with string, for roasting
Middle. Trussed with string and skewers for roasting—a general method with poulterers to give a mediocre specimen the best appearance, the thighs being covered
Bottom. Trussed with string, for boiling, the legs being completely hidden, and the tail-piece tucked in

chicken; but I am somewhat fastidious in this matter and prefer soft stuffing, with crisp slices of bacon on the outside—which, of course, is by the way. To secure the back part of the bird pass the threaded needle through the flesh of the back close to the tail end, carry the string around the leg, back through the body under the end of the keel-bone; and when it is over the other leg tie the ends securely and cut them. Remove the ends of the toes of the chicken—or the whole feet and half-way up the shank-bone of an old fowl—and the bird is ready.

If skewers be preferred to string then three will be required for trussing; and to prevent the holes being too large, steel skewers could be used. The former method (using string only) is, in my opinion, much the better, especially for the stern of the bird. To proceed with skewers—the carcass already having been drawn—fold the wings, pull the loose skin or flap of the front well over the bird's back, and run a skewer through to secure them. Next pull the wings along the thighs at the top, put a skewer right through the body from side to side, and catch the ends of the wings, near the elbows, on each end of the skewer, which, as can be seen, gives the bird a very plump frontal appearance. To complete the skewering, close the opening made for the removal of the intestines, by pushing a third skewer first through one side of the cut, then through the thin part of the leg at or near the hock, the end of the breastbone, the other leg, and finally passing it out by securing the opposite side of the cut.

A small item, but one which adds considerably to the appearance of a table chicken, no matter for what purpose it is trussed, is to trim the pinions. This is done by cutting away the folds of loose skin on the outside edges of the wings where the quill feathers have grown, and by removing the small joint at the extreme end (the "finger"), as well as the "thumb" or spur of the wing. If, when drawn—and before it is trussed—the carcass does not lie flat on its back with the wings folded, hold it in the left hand, breast downwards, and with the back of the trussing knife give a sharp tap to the collar bone on each side of the backbone between it and the base of the wing joint. To do so, loosen the skin from the neck and breast, and draw it back and well under the fowl. This generally has the desired effect of keeping the bird steady when it is served on the dish for carving. That is as much as need be done in "improving" it; which reminds me to suggest that should a roach-backed or faulty-hipped cockerel have to be killed for home use—it should never be marketed—dismembering it after cooking before the chicken is brought on to the meal table will save much bother.

Skinning Up

Before passing on to consider how to truss a fowl for boiling, it will be as well to describe the method which is generally adopted by retailers when trussing fowls. After drawing the bird and making sure that the spleen is removed entire with the liver, and that any oddments adhering to the ribs, etc., are cleared away, the operator commences the process of "skinning up," which consists of loosening the skin from both legs, as well as the front and shoulders. The end of one leg (the shank of it) is held in one hand, and the fore and middle fingers of the other hand are passed inside through the opening made at the rear, pressed through to the skin and worked around, from the top of the thigh to the "knee," until the whole skin of that part of the leg is loosened from the flesh. This process is repeated with the other leg; after which the neck skin is lifted and loosened, the skin rolled back from the breast, and the collar bone tapped as mentioned in the preceding paragraph.

Trussing then begins with a wooden skewer, which is run through the flesh and sinew above the first wing joint (of the nearest wing); the legs are drawn back with the left hand and the skewer is driven through the side of the bird, through the flesh behind the thigh joint of the leg, continuing through to the far side of the fowl, the second leg, and finally through the other wing, the bird resting on its back with the neck end towards the operator. The trussing needle is then threaded and the fowl is held breast down and neck away from the trusser. The needle is driven in diagonally from the bony side of the bird near the vent, coming through near the thin skin covering the abdomen; the needle is then passed through a portion of the loosened skin of the leg and through the side of the fowl to the opposite side, and back to the vent the reverse way, picking up a portion of the loosened skin of the other leg, then diagonally through the bony side, so that the twine comes out directly opposite the hole made where the needle was first inserted, when the twine is drawn tightly, knotted, and cut off. Thus, when the trussing has been properly performed, the front is thrown up prominently by the skewered wings, while the tightening of the skin (by the twine) over the fleshy parts of the legs gives the whole breast a plump appearance.

The success of this method of trussing depends solely on one's ability to take up the right amount of the loosened skin; and it requires some practice before perfection is achieved. It is remarkable, however, what an expert can do with it when he has a second or lower-grade chicken to truss; and I must admit candidly that it does visibly improve the appearance of such a bird. Still, they are not the fowls which the producer should offer to the public if he wish to obtain and maintain a good connexion in table poultry; and there is certainly no need so to prepare a first-grade country chicken, and particularly when trussing it for sale direct to the consumer.

Preparing a "Boiler"

When preparing a fowl for boiling—and it is generally an old bird rather than a chicken which is so cooked—the method to be followed up to a certain point is similar to trussing for roasting, in that the neck, crop and merrythought are removed and the

bird is cleanly drawn. Then proceed to loosen the skin around each leg, as already described, taking great care not to tear the skin. Now make a cut through the skin to the bone at the inside of the leg, about 1 in. above the hock joint or "knee," and another in front about a couple of inches below the hock, this latter being for the purpose of dividing the sinews and enabling the foot to be twisted right round so that it shall come at the back of the carcass without in any way breaking the shank bone. The bird should be placed on its back, stern towards the trusser, and the shank pressed down near the side of the body and then under the fleshy part of the leg, so that the claws are practically on the back of the fowl. Next insert the fingers under the skin from inside the carcass—as when loosening the skin in the first place—feel for the first cut in the leg, push the "knee" (twisted) through it and draw the leg under the skin, making the "thigh" disappear altogether from view; and repeat the process with the other leg. Only the feet and part of the shank will then be visible; they must be struck off so that no portion of the legs will appear.

The wings must be secured as when trussing for roasting, by passing the threaded needle under the leg at the back of the "knee" from one side to the corresponding part of the other, and through the joint and pinion of each wing, the ends of the string being securely fastened together, thus keeping the legs and wings firmly to the body. To secure the ends of the legs, pass a second string through the body above the knee or hock—which must be felt for, as it cannot be seen—then under the breastbone down to the hock on the opposite side, and bring it round the back. The tail piece (or "parson's nose") should be tucked into the body, and the string secured; and the fowl is ready for boiling. It might be possible to use skewers for the purpose, as in the case of trussing by their means for roasting; but it is imperative when a fowl has to be boiled—i.e. brought to the boil and simmered—that its legs are securely fastened and so bound that neither of them can be forced up and thereby burst the skin while cooking is in progress. Some cooks prepare the bird *en casserole* while others roast it after boiling.

Taking Out the Bones

There is sometimes a demand for fowls which have been deboned; hence the process may be described here, because, in my opinion, the producer who is in direct touch with consumers should be acquainted with more than one way of preparing the birds. Deboning is a more difficult undertaking than trussing; but one should become proficient at it after a little practice. In this, as in all matters connected with table poultry production, one should take time at first, because each move has to be studied before speed can be attained. Commence by removing the head, neck and crop of the bird in the usual way, but do not otherwise draw it, although the pinions could be trimmed. One thing to note is that deboning requires the use of a very sharp knife; but if the edge of it is kept against the bone—where it should be—there is no danger of cutting oneself. Having placed the bird on the bench on its stern, take the outer skin and fold it downwards all round, glove fashion. The prominent objects will first be the merrythought and the wings; scrape the former clear and remove it, as described previously, then disarticulate the wings by cutting through the joints. Having done so, continue turning the skin back, stripping it over the leg joints and dividing them where the drumstick joins the thigh, passing the knife through below the joint and cutting upwards.

Now turn the fowl over, and scrape out the oyster pieces (one in each depression near the hips) and all the meat of the bird's back. Keep the edge of the knife inwards and all will go well until the drumsticks are in the way. Denude them of their flesh, and strike each bone a sharp blow with the back of the knife just below the knee joint, as it will easily break, but be careful to remove all splinters. Then take the bone out of the pinions of the wing; cut out carefully the breast fillets and the flesh on the carcass, the thighs, and any other part, and continue to turn the flesh and skin backwards, keeping the edge of the knife towards the bone, until nothing remains to cut. The fowl is then deboned, so the skin should be turned right side out, the fillets, etc., placed inside, and the "bird" rolled up and handed in for the cook to stuff, because that is not part of the producer's work. It is scarcely necessary to add that such operations as trussing and deboning fowls can be the better understood by attending practical demonstrations, and using one's eyes, than from the most minute description of them.

The Waste Parts

When commencing my remarks on drawing and trussing, I mention that the waste parts removed from the fowl should be set aside until trussing is completed. These are often considered as refuse, but some of them can be put to good use. The giblets, i.e. the liver, gizzard, heart, neck, and feet—unless the latter are left on the bird—should be delivered with the carcass, because they are generally required in the preparation of "stock," while in some parts of the country they are used, along with steak and hard-boiled eggs, for the contents of giblet pie. However, these parts should be properly prepared, wrapped in

grease-proof paper, and packed with the fowl. Some trussers put them back into the carcass; but there are those who cook poultry who know not of giblets, so I always see that these parts are distinct from the bird. I have seen trussed fowls with the liver on one side and the gizzard on the other, under the wings; but that is not my way of trussing. The neck should be scrubbed to remove the blood from the top of it. The liver, consisting of two lobes, of a red-brown colour, has a small bag of dark green fluid attached to it; and this latter, the gall bladder, must be very carefully cut away entire.

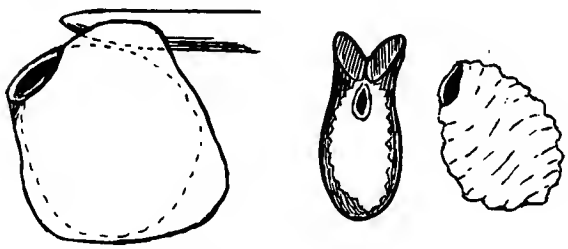


FIG. 195. OPENING THE GIZZARD

On the left, the gizzard, freed of external fat, etc., in position with the knife in the bulbous fleshy top. Centre, a section (front view), the flesh cut ready for peeling off with finger and thumb; the cut must be made to the inside tough bag only. Right, the bag (removed) containing grit and food

Most novices will be able to detect the heart; it should be cut through and washed. The feet should be scrubbed free of any trace of dirt, or they can be scalded and skinned. The gizzard, a heavy and flat-shaped organ somewhat similar to the palm of one's hand, should be freed of the connecting tube and then opened so that the muscular inside bag (generally containing grit and a few etceteras, even when the bird has been fasted) can be taken out intact. This is accomplished by holding the gizzard in the left hand with its soft and bulbous part in the palm and the opening of it on top and towards the left. Then cut into the organ, longitudinally, at the part opposite the natural opening, until the tough corrugated inside is reached, when the covering can be peeled off with the thumb. The cut should be made at the top of it, the thick hard-fleshed part of the gizzard, otherwise the knife will pierce the inner case and thus make it most difficult to remove.

All other parts of the intestines should be wrapped up in paper and burnt, although in some countries this offal is carefully collected and given, cooked or uncooked, to pigs. There are cooks who prize the cocks' combs, while fowls' brains are dealt with as a separate item; but I consider the whole head as part of the offal to be destroyed. In the ordinary way of preparing poultry, the skin is not removed; and yet there are people to whom this is a delicacy, especially if it be cooked until crisp. The heart and the liver are also favoured by some—chicken liver on toast is considered a savoury—and I have heard of the demand for chicken liver being so great in some districts that trussers of fowls did not deliver it as part of the giblets unless the purchaser of the bird specially stipulated for its return. When trussing poultry for table, therefore, it is as well to remember that all the offal is not waste; hence such parts of it as I have mentioned should be sent to customers.

It is perhaps hardly necessary for me to remark that there is a difference between live and dead weight. Some authorities put it as high as 12 per cent for chickens which have been fasted for twenty-four hours, killed by simple dislocation of the neck (not bled), and dry-picked (i.e. plucked in the English way), and 35 per cent for the completely drawn weight —when the bird is fully prepared for the oven. It is generally reckoned, however, that, allowing for feathers and shrinkage after death, the loss is about 1 oz. for each pound, although the complete drawn weight varies slightly. Records of weights I have taken from time to time prove that on live chickens weighing $4\frac{3}{4}$ lb. the loss in plucking is, on an average, $\frac{1}{2}$ lb., while in drawing (including the removal of the head and feet) it amounts to 2 lb. In some experiments undertaken in connexion with the fattening of fowls, the proportions of the different parts of the birds which were removed in trussing were ascertained; and the average result for seventy-two chickens of different breeds, calculated on the basis of the dead weights, was as follows: dressed and drawn carcass 66·4 per cent; giblets 5·5 per cent; head and feet 11·3 per cent; feathers 8·3 per cent; and entrails 8·5 per cent.

Marketing the Produce

So far I have dealt with only one phase of the marketing of table fowls, viz. that part of it which concerns direct sales between the producer and the consumer as a means of the former disposing of the surplus cockerels from the usual hatches without actually specializing in table birds. Dealing with the cockerels in this way is probably as much as the novice will attempt at the beginning; in fact, he will be wise to confine his efforts to such a small scale, because those who purchase the fowls—almost invariably one's friends and acquaintances—are generally very tolerant of the slips which are always made at first. It will enable him to gain some useful experience in the growing of chickens, because he will be anxious to show what can be done in this line, while if he trough-feed the birds—he will not attempt machine-feeding such small numbers—he should get a very good idea of the cost of producing them to

different weights. It will be his object to keep count of the outgoings in connexion with the cockerels, which means that their food will have to be kept distinct from that which is given to the layers and the breeding stock, and also the pullet chickens which are being reared at the same time.

To some poultry-keepers, admittedly, this is looked upon as an intolerable nuisance; but such as they generally keep fowls as a hobby and are quite satisfied if, at the end of the year, they are not out of pocket over it. However, if one anticipates taking up table poultry production in a serious manner, as a profitable side-line, if not as a whole-time occupation, one should be fully conversant with the costs of production. Perhaps at the beginning this direct trade will be a somewhat precarious one owing to the uncertainty of the orders—and the habit some private buyers have of cancelling their orders or postponing delivery—but if the producer be out for business, and can guarantee his goods, he should not find much, if any, difficulty in disposing of the birds to advantage. It is seldom that the whole of the cockerels, even from one hatch, will reach the killing stage at the same time, while if the hatching season be prolonged for three months, there will be sufficient surplus cockerels for a private trade to carry the producer over a considerable part of the year.

Commencing in such a way, and gaining experience as he proceeds, the novice will doubtless be encouraged to enlarge the table bird section; but unless he can work up a very considerable connexion in direct sales —in such a way as I have mentioned, or, by judicious advertising, by widening his scope and trade through the post—he will probably have to dispose of some of the stock through middlemen. In doing so, however, he will be well advised to make full inquiries as to the class of bird required; and since he will scarcely be in a position to deal on a large scale, I advise him to get into touch with retailers in the locality, if possible, rather than attempt to supply the best markets.

As it is, market salesmen, in London at any rate, naturally do not find it convenient to handle what may be termed odds and ends; but my experience is that local buyers, and especially butchers, are by no means averse to purchasing table chickens in small

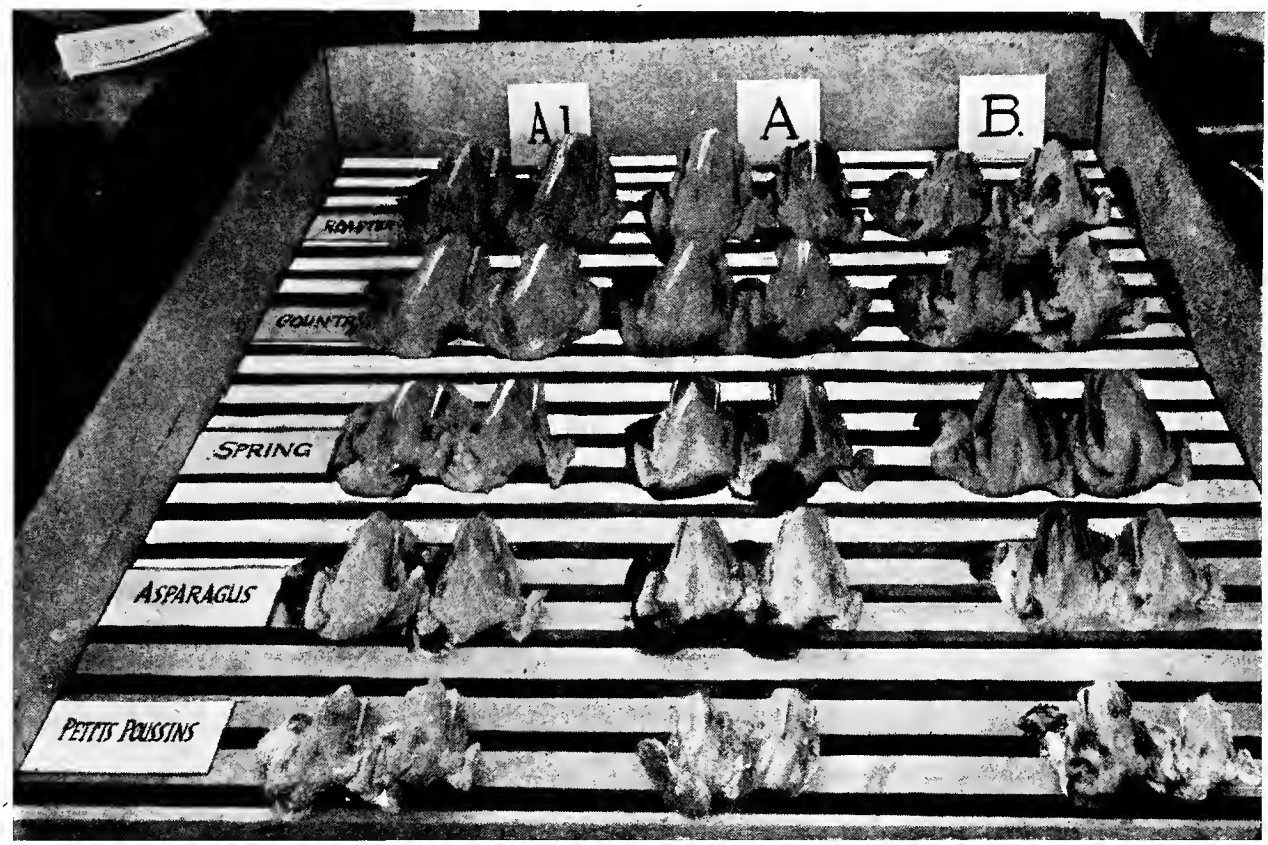


FIG. 196. TABLE FOWLS GRADED ACCORDING TO THE SUGGESTIONS OF THE MINISTRY OF AGRICULTURE

lots, even as low as half a dozen at a time, if they can depend on the birds being of good quality. And since they will take them alive, it should pay the producer to market his chickens in such a way. At any rate, unless he is fortunate enough to get into touch with hotels, clubs, restaurants, and the like—and the commissions to those who handle the fowls do not eat up the profits—he should find such local buyers an excellent channel through which to sell his table birds. With him, it is a matter of having chickens ready for one season rather than at all times of the year; and if he be wise enough to hatch early in the year he should have the cockerels in fit condition for sale before the glut arrives.

The Sales Side

Producers who go in for table fowls on a large scale must have their wits about them if they wish to benefit to the utmost extent from that which they have produced. The aim of the progressive poultry rearer is to produce the best article for the best market. It may be, as a salesman remarked to me quite recently, that many can produce but few can sell. Admittedly, he was referring to eggs, and, needless to say, he was explaining to me why, in his opinion, salesmen are essential in the poultry industry. However, those who produce the goods but sell them at a loss do so, in many cases, because of their own thoughtlessness. They will not study the question of marketing; and to such an extent is this so that there is a Market Division of the Ministry of Agriculture and Fisheries set up specially to give assistance in this direction, and whose National Mark Schemes are of the greatest value to producers. I know too well that some people who take up poultry-farming with the idea of gaining a livelihood from it do so under the impression that sales can be worked up after production is finished; and yet, everyone who produces with the idea of profit should have a definite market for which to produce—it should be fixed up before production commences. In most parts of the country there are markets at which table poultry can be disposed of to the advantage of the producer; but they have to be found and studied.

The producer on a large scale can succeed only when he is well acquainted with the form and seasons in which his goods are likely to realize the best prices. He must make it his interest, his livelihood, to study these matters, so that he can ensure an adequate return for his labour. He will know that at certain times foreign competition has to be faced, seasons in which supplies from overseas, from Canada, America, the Irish Free State, Holland, Poland, and the Central European states, are plentiful. It is absolutely essential for him to study the demands, local and otherwise, for which he is catering; and when he is dealing with market salesmen it is particularly beneficial for him to get in with those upon whom he can rely—there are several salesmen of the present day whose word is their bond, and it ought not to be a difficult matter to get into touch with them. Expert salesmen almost invariably know when to expect a shortage of supplies; and they would, I feel sure, be only too pleased to advise producers on which days to forward the birds.

As far as the poultry market is concerned, every person who keeps poultry for profit is a prospective sender to some market or other. London is easily the biggest consumer of poultry in England; and every kind of fowl—good, bad, and indifferent—can be disposed of on the London market. Needless to say, the good is much sought after; and for this reason, to produce low-grade chickens, even in tens of thousands, will never pay at the price they fetch. It is absurd to imagine that anything is good enough for sale at a remunerative price; consignments of poultry of varying sizes and age, sent at such times as suit the rearer's convenience alone, will never realize satisfactory returns for the producer, and it is essential for him to learn the details of the best manner in which to dispose of the fowls. Of course, cases exist where it is more advantageous for the rearer to dispose of his produce locally than to incur the expense of carriage and commission.

There are many poultry-keepers in England who have splendid table birds but do not reap the financial benefit from them which they are entitled to do; the poultry are marketed at the wrong time or spoilt in preparation for market, or else they are not marketed at all but sold to a higgler who will call at the door. Sometimes, nevertheless, the higgler is admittedly the handiest buyer, and by no means a useless one, either. I know of more than one producer in a fairly big way who will have nothing to do with market men. They would sooner sell to the weekly caller at lower than recognized market prices than send to market, despite facilities for quick transit and low rates of carriage; but this is largely because the chief item, hard cash, is safe—it is a ready-money trade with them, whereas there is sometimes uncertainty when the produce is sent far from home.

The Middleman

For reasons justified or otherwise, there exists an idea that market salesmen are unscrupulous. It has certainly been my experience that some so-called salesmen have lived up to that reputation, possibly owing to the encouragement they have had from the actions of ignorant poultry senders; and yet, a genuine salesman would not treat his clients in such

an unscrupulous manner. The market salesman's income is derived from the commission on the sales of the produce of the sender; and although the latter has to take the salesman's word for it, no sensible man would commit commercial suicide by returning a bad price when the market is not bad, because it is certain the sender would not only find another salesman but would make it his business to let others know of the treatment he had received. Producers who send their stock to unknown salesmen without inquiries will stand a chance of getting what they deserve—nothing.

However, there are salesmen with whom it is a pleasure to deal, and who have been known to return to the producer more than he himself could make for the birds. Those who desire to supply the markets, therefore, should endeavour to pay the salesman a visit and make themselves known, since it is the best way to create that confidence which ensures success. I find that salesmen, as a whole, are keen to know from whom they can depend upon getting quality in sufficient quantity to make it worth their while to open an account; and when the right class of fowl is forthcoming they can be relied upon to return adequate prices. But, the salesman's special requirements should be studied and, as far as possible, complied with, if at all reasonable.

The London Trade

Just when fowls are in greatest demand for table, and the particular class of bird required for different markets, are matters which vary according to localities. Hence, these are among the points to which the producer should pay particular attention. It is hardly possible for me to deal, even briefly, with the numerous markets in this country; but some particulars concerning the London trade will be useful.

FIG. 197. TABLE CHICKENS

Showing the method of packing graded table chickens for the London market

Taken generally, it may be said that there are four seasons for market poultry, viz. spring, summer, winter, and Christmas. Spring is the time when the producer should reap most advantage from the winter-hatched cockerels, because at that season they are scarce; and there is always a demand at high prices for spring chickens scaling 2 lb. and over. It is owing to the scarcity that so much American and other foreign stuff is used in the market, but good English chickens always realize more money.

The demand starts with the very small birds for *petits poussins* in February; then, as the weeks go on, it changes gradually for an increasingly-sized chicken, until May, when fowls under 1½ lb. are not really required. That is the reason for small Leghorn cockerels making such bad prices about this time. From about mid-July to November there is almost

invariably a steady decline in the price, owing to the fact that from June onwards greatly increased supplies are generally available, in addition to which London begins to empty, many people going away for their holidays. It is then that producers should endeavour to find a retail market for their chickens at the nearest seaside or holiday resort. The London poultry trade diminishes in proportion to this diverted demand, while during August the game season commences; grouse, which come in from the 12th of that month, materially affect the demand for and consequently the price of chicken. Towards the end of August, however, there is an increased demand for live old hens, owing to a religious festival of the Jews, although until the cold weather arrives there is no proper demand for fat old hens killed and clean plucked, and practically the only buyers are the Jews, who must, however, have them alive owing to their religion which requires them to be killed by a cosher butcher.

Old hens make their best prices in the market during April, May, and June; but if the producer will study the Jewish festivals he can make more money from the birds at different seasons by selling direct for the cosher trade—that described by the Jewish ritual. Jewish buyers invariably insist upon large fat hens; hence the demand is for birds weighing 4½ lb. and over. Granted there is a slight demand for light breed hens, but they always make a much lower price owing to their so seldom getting really fat; and, in addition, large quantities are sent to local markets and are sold at as low as 1s. to 1s. 6d. in autumn, when the poultry farms are being culled. There is really not a profitable demand for cocks which have been in the breeding pens, because they have lost their quality for table; and it is always better to use the birds at home or to sell them locally for soup. Throughout winter it is difficult for London to receive too much good poultry, although, of course, the prices are not so high as in spring.

During recent years the demand for chickens at Christmas has not been too good, owing to the enormous quantities of turkeys which are imported from Canada, the Argentine, and many parts of Europe. However, I can generally dispose of a fair amount of choice table fowls around Christmas by direct sales to consumers, as well as through retailers, because, small as are some turkeys which are imported, they are too big for many people, who prefer the smaller size and better quality of the home-produced young fowl. It is for this back-end trade that late-hatched and autumn chickens come in decidedly handy; and provided the producer has the accommodation for rearing such birds—and on a wide range during a normal summer they make headway with comparatively little attention and the minimum of hand feeding—he should not hesitate to keep his incubators and rearers employed. Inquiries in the neighbourhood should satisfy him as to whether such a trade is possible or not; but in many parts of the Home Counties, at any rate, catering for this demand enables one to continue production with very few gaps throughout the year.

Petits Poussins

I have mentioned *petits poussins*; and this particular class of bird is one which can be made remunerative to the producer who will take the trouble to understand it from the market point of view, taking into consideration at the same time his own breeding arrangements for the following season. A poultry market man of many years' standing, and also a poultry-farmer in a modest way, who in consequence was able to appreciate thoroughly what the markets require and how to market the produce profitably, once supplied me with the following particulars concerning *petits poussins*—

A genuine demand for *petits poussins* commences in February, for the tiny chicken weighing 8 oz. when killed and clean plucked; and as the weeks follow, the demand slowly changes for *poussins* of a larger size, until it reaches May or June, when nothing is wanted under 1¼ lb. It will be seen from this that the producer will have to start hatching very early, and the question as to whether it is profitable for him to hatch for this specific object is one for his own discretion. The actual time of marketing *poussins* must also be at the discretion of the particular producer in conjunction with the state of the market, because one who is rearing for stock cockerels can only market his surplus when they have reached the age at which he can decide which he intends to keep, and which he intends to market.

The real *petit poussin* is a bird which should be milk-fed, in order that it may be plump and soft. When it is ready for marketing it should be killed and absolutely clean plucked. It should be very carefully cooled, and graded in sizes. After this the birds should be packed in boxes, each containing a dozen. The best packing material to use is green reeds, because with these one can make a very attractive consignment, providing the birds are properly prepared. A box suitable for holding a dozen birds should be readily obtainable at most grocers' shops, and it is really unnecessary to have special boxes for this purpose. If the producer is unable to obtain green reeds, or even fern leaves, he should use grease-proof paper. I would point out that black-feathered birds do not look anything like so attractive as the white-feathered varieties. It is really surprising how well some people manage to make a consignment look, and how badly others do, with exactly similar material; and with this particular trade, appearance is almost three parts of the selling.

As a word of warning, I would mention that *poussins* with full crops are invariably condemned as being unsaleable. The producer must keep in close touch with the market for this trade, because a particular size *poussin* which is wanted this week may not be wanted

next week, and a bird of this size cannot be kept for any length of time; and even if it is put into cold store it is surprising how rapidly it deteriorates both in appearance and condition.

Prior to the Ministry of Agriculture and Fisheries taking a hand in the marketing of poultry, spring chickens followed *petits poussins*, birds classed as small spring chickens not being required unless 2 lb. when killed and clean plucked, and those known as large spring chickens weighing 3½ lb. and over; and it is difficult to describe such a bird in minute detail, although most obvious to the expert eye. However, to be sold as a chicken the flesh must be soft and tender, but not flabby; and as a rule the birds must be under five months old. Directly a pullet starts to lay or has reached the laying stage she is a hen as far as the London market is concerned; just as a cockerel which reaches the crowing stage, or has shown much spur, is to the market man "cocky" or "staggy." The flesh in both cases becomes "hard" and

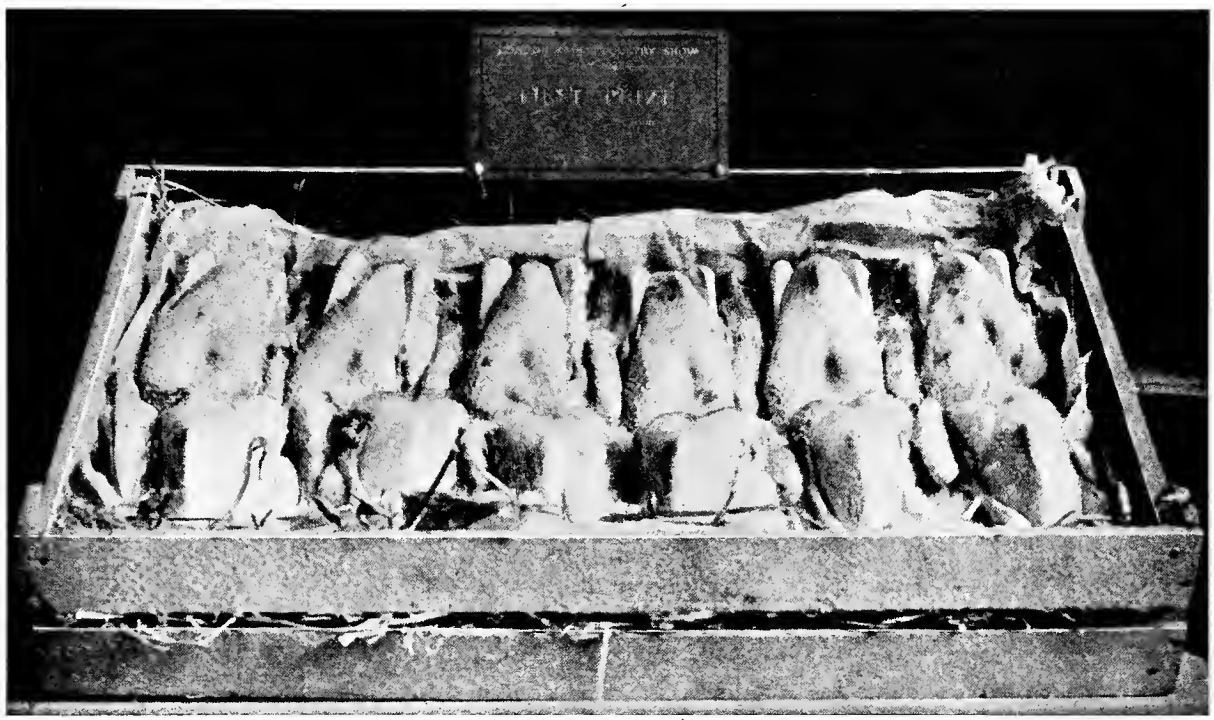


FIG. 198. TABLE CHICKENS

A pack of twelve chickens, awarded first prize at a Smithfield Table Poultry Show

they came into season about April. To scale such weights at that time of the year they have to be hatched well in advance of the natural season. Granted that in April there are thousands of spring chickens, inasmuch as they are hatched in spring-time; but these birds are scarcely fit for market before August, so that when they are ready for table they are obtainable in such large numbers that, obviously, they do not realize top prices. But chickens which are hatched in winter and are forward enough for market in spring are most remunerative, particularly if they are soft-fleshed and have plenty of meat on the best parts—essential points when growing young fowls for the pick of the early markets.

Producers are often at a loss to know what constitutes a "chicken" for market purposes. Admittedly, begins to deteriorate in the eyes of the expert, whether he be fattener or salesman. The flesh and skin of such birds seem to assume a different texture, and these young fowls are generally not accepted as soft roasters. These remarks, let me add, do not refer to young birds which have been cooped up and fattened or trough-fed, because they can be sold at a much later stage as soft roasting chickens. They must, of course, be specially fed with wet mash to possess the desired softness of flesh.

National Mark Scheme

It must be admitted that, of recent years, the Ministry of Agriculture and Fisheries has been rendering valuable assistance to poultry producers; and not the least of its activities has been in formulating the

National Mark Scheme for dressed poultry under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931, which enable the Minister of Agriculture and Fisheries to make regulations prescribing grade designations for any kind of agricultural produce and defining the quality indicated by such designations. Full particulars of grading and marking dressed poultry are given in Marketing Leaflet No. 17, copies of which can be obtained, gratis, on application to the Markets Division, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.; and to such an extent is assistance being rendered in connexion with National Mark poultry that a leaflet with recipes (Marketing Leaflet No. 17 b) is available, which shows that chicken, properly cooked and served, is not an expensive dish.

these birds, produced in England and Wales, are as shown below.

" Surrey " Chickens

As will be seen, the list omits all mention of country chickens and capons. The former, however, are of three grades, viz. well-fatted, with white legs and white skin of fine texture, straight breastbone, full breasted, and free from all blemishes; well-conditioned with white or coloured skin; and ordinary other marketable birds, including damaged and inferior specimens of previous grades. The first-named, nevertheless, would be "Surreys," which reminds me that trade terms are somewhat confusing to the novice, and "Surrey" does not of necessity refer to the county from which those birds are sent

Grade Designation	Definition of Quality		
	Weight Range (Minimum and Maximum)	State or Condition	
(1)	(2)	(3)	
		Chickens	
Select *Poussins*	9–20 oz.	Milk-fed; straight, unbroken breastbone; free from blemishes.	Undrawn; "clean-picked," i.e. the legs, body, wings, and two-thirds of the neck from the base to be free from all feathers, including "pin" feathers (stubs).
Select Asparagus Chicken	1¼–2 lb.		
Select Chicken	2 lb. and over	Well-conditioned; skin of fine texture; straight, unbroken breastbone; reasonably full breasted; soft and flexible cartilage; free from blemishes.	
Select "Surrey" Chicken	3½ lb. and over	Well-fattened; skin of fine texture; straight, unbroken breastbone; full breasted; soft and flexible cartilage; free from blemishes.	
		Fowls	
Select Roasters (Pullets)	3 lb. and over	Well-conditioned; straight, unbroken breastbone; full breasted; flexible cartilage; free from blemishes.	
Select Roasters (Cockerels)	4 lb. and over	Well-conditioned; straight, unbroken breastbone; reasonably full breasted; flexible cartilage; free from blemishes.	Do.[1]
Select Boilers (Hens)	4 lb. and over	Well-conditioned; straight, unbroken breastbone.	

[1] The roping of dressed poultry is advised in hot weather, when suitable clean paper may be inserted in the cavity.

However, to return to marketing, as the Minister points out, it is no exaggeration to say that well-conditioned home-produced poultry is the finest obtainable, and with the guarantee of quality which the National Mark gives, those who buy National Mark birds will be assured of satisfaction. The poultry sold under this mark are chickens and fowls, ducks, geese, and turkeys; but there is only one quality—the best. There are four classes of chicken, viz. select *poussins*, asparagus chicken, chicken, and "Surrey" chicken, and three of fowls—select roasters (pullets), roasters (cockerels), and boilers (hens). The grade designations and definitions of quality of

to market, or, in fact, to any particular breed. As it is, there is no standard breed of fowl known as Surrey—as, for instance, there is the Sussex—and, although the Dorking originated in that county, few, if indeed any, of the present-day five-toed Dorkings would be classified as "Surreys" by anyone in the trade. It is quite common to have Kent-bred chickens finished in Sussex, and yet fully meriting the market term "Surreys." The name simply denotes the style in which the bird is sent; in this case the highest quality. Country chickens, when dressed for market, scale from 3½ lb. to 6 lb. each, but those weighing 4 lb. to 4½ lb. are in greatest

demand. On the other hand, capons must be super fat and of extra fine quality, and they generally scale 7 lb. and upwards, although some capons from the light breeds which are suitable for table (such as Bresse) do not reach that weight.

London Market Quotations

The grade designations mentioned above are solely in connexion with poultry which are sold under the National Mark; but on the London market there are no regular quotations for *poussins*, asparagus chickens, roasters or boilers as such, the grades being solely by size, colour, and texture, and the prices vary accordingly. Thus, there are four grades of "Surreys" and six grades of "country" chickens, but only one of hens, as follows—

Surrey chickens: white, large, medium; coloured; and coarse. Country chickens: white, large, small; coloured, large, medium, small; coarse. Old hens: English.

In addition, of course, there are Irish (fat and unfattened), Dutch (white and yellow), Polish, Central European (three grades), and Canadian, which arrive at different seasons, and are sold as "imported," while old hens, English, are on sale all through the year. To give the reader some idea of the variation of prices I have prepared the annexed table; but, while the figures have been taken from the latest ones available, it must not be thought that the same prices rule every year.

Note. In February, from the middle to the end of the month large white Surreys were quoted at 1s. 3d. to 1s. 5d. per lb., but for the first two weeks they were at 1s. 2d. to 1s. 4d. In June the same class of bird was quoted at 1s. 6d. to 1s. 7d. for the first three weeks, and 1s. 5d. to 1s. 6d. for the last week; in July 1s. 4½d. to 1s. 7d. for the first two weeks, 1s. 3d. to 1s. 5d. for the third week, and 1s. 3d. to 1s. 4d. for the remainder of the month; after mid-August the highest price was 1s. 3d.; in September the price rose by 1d. per lb., during the third and fourth weeks; after the third week of October the highest price was 1s. 3d.; quotations were steady in November; but in December prices rose from 1s. 3d.–1s. 4d. to 1s. 4d.–1s. 5d. during the second week, and to 1s. 4d.–1s. 6d. during the third week. The foregoing remarks refer to the variations of one class of chicken only, viz. "Surreys," white, large; but most of the others were similarly affected.

The Best Seasons

Seasons for the marketing of chickens vary according to locality, but, taken generally, the best prices are obtained from March to June; so that when the producer feels sufficiently confident to launch out on a fairly extensive scale, it is advisable for him to have birds of some sort ready for disposal during every week from February onwards. After June there is almost invariably a large supply of sizable young fowls available until the end of October; and, in any case, table poultry fetch the lowest prices in summer—unless one is in touch with the holiday trade—simply because there is then a glut on account of the fact that cockerels are being weeded out to allow all possible space being given over to the pullets which are being reared for autumn and winter laying, and, too, because first-season hens are being displaced by birds of the year, and the breeding pens are being disbanded. Of recent times poultry-farmers are finding it beneficial to commence their hatching operations much earlier than formerly, and winter chickens are becoming a feature, quite distinct from the birds which are hatched for egg production.

It is always as well for the producer who is catering for the London market to remember that table chickens which command the best prices, and which are in greatest demand in spring particularly, are those which have been specially fed and fattened. It must not be thought that a crammed fowl is one merely carrying a large quantity of superfluous fat in its abdominal cavity; when the process is properly carried out there is an increased amount of flesh on its body, which is softened, ripened as a matter of fact, by the fat which is blended with it. Although it may not be thought so, fowls are largely bought on "appearance"; a much better price is obtainable for those which look neat, that is, are well dressed to please the eye, than those which are bruised. And there is a vast difference between a well-fattened table chicken and one which has not been subjected to any process of fattening and is marketed in what is known as a lean condition. The methods or styles of dressing fowls differ in various centres, hence it is always wise to consult the salesman on such matters. Whether chickens should be marketed alive or dead is a matter of opinion.

Packing for Market

One of the most important factors regarding fowls for market is that, after the birds have been fasted for twenty-four hours, then killed and plucked, they should be thoroughly cooled. It is absolutely disastrous to pack chickens and dispatch them too quickly after killing. It is essential to allow the animal heat to leave the body before packing; and for this purpose it is as necessary to have proper cooling arrangements as it is to be very careful with the killing and plucking —one must be skilled in these matters to make the best of them. Fowls which are packed while still

warm can only arrive in an unsatisfactory condition; and yet it is a mistake often made, and causes much loss to senders. During very hot weather there is the possibility of dead birds turning green in transit; and the safeguards against this are either to rope (gut) them prior to sending, or to forward the fowls alive to the salesman, with instructions for him to kill and clean-pick, remembering, in this latter case, that there is a difference between the weights of live and dead birds.

When packing dead stuff to send to market always bear in mind that an airtight package of perishable produce will probably be rotten on arrival. If suitable crates for live chickens, or boxes or hampers for dead ones are not on hand, it is much better to arrange with the salesman for a supply—he will send them through carriage paid—than to make a hastily improvised package with detrimental results to the producer, because nothing looks worse on a market than an incorrectly packed consignment of poultry. Do not pack the chickens too tightly; and use straw for the purpose. If sending alive, never overcrowd the birds; it is illegal and cruel, while some birds may be dead on arrival, and the loss is entirely the sender's.

The next point is the actual dispatching; labels sent by the salesman ensure the goods being delivered direct into the market, and if consigned by "Dealers' Rate," or, if sent alive, by "Live Poultry for Consumption Rate," they will travel by the cheapest rates available for the purpose. As to the time of dispatching, even producers who live some distance from the market should find an evening train, which invariably ensures the consignment being delivered into the market very early the following morning. And needless to add, as dead poultry are perishable goods, the sender will forward them by passenger train. Live birds should also be so sent.

It is essential that dead birds be properly packed; and packing requires some skill. Each specimen should be handled in such a way that it will not be bruised or "barked"; pack in clean long straw, or line the package with clean plain paper, but do not wrap the fowls in paper. No matter whether hampers, pens, or crates are used for the transmission of the produce they must be clean, suitably made, and of regular size. Many chickens sent to market are packed without regard to uniformity of size or appearance; but in such a case the salesman probably returns "any old price," which is not remunerative to the sender, although it is what he deserves. Uniformity of size and weight when dispatching should be aimed at, and the producer cannot be too particular in this matter; it pays him well to select and so arrange the dressed birds that this uniformity idea is carried out. Often enough, one or two poor fowls in a consignment will spoil a good sale, and it is much wiser, if there are second-rate birds to be marketed, to pack them by themselves. They will not look as bad then as when among a lot of good specimens; and they can generally be sent to some market where a first-class article is not absolutely necessary.

Approved Packages

In this matter of forwarding birds to market, the approved packages for poultry to which the National Mark is applied are ideal for the purpose; and, as set out in the leaflet to which I have already referred, they are as follows—

Package and Pack. Chicken and fowls to be packed in single layers in non-returnable wooden boxes or crates, or returnables approved by the Ministry. Select *Poussin* chicken and Select Asparagus chicken to be packed 6, 12, 16, or 20 to the box; Select chicken, Select Surrey chicken, Select pullets, Cockerels and Hens to be packed 6, 10, or 12 to the box. Chicken and fowls to be shaped and packed in accordance with trade requirements. Every endeavour should be made in the interests of uniformity of the pack to secure that poultry of the same class only are packed in any container.

Lining Paper. All crates and boxes to be lined with clean plain paper, either absorbent or grease-proof, according to trade requirements.

Declaration of Contents. In addition to the grade designation, the contents of each package to be declared as regards count and net weight. Colour of skin should also be declared—i.e. "White," "Yellow," or "Mixed," as the case may be.

In addition to the foregoing, the Ministry gives the following specifications for non-returnable wooden boxes or crates which may be used when the National Mark is applied to dressed poultry—

APPROXIMATE INTERNAL MEASUREMENTS OF BOXES OR CRATES

Weight per Bird	Size of Box or Crate			Maximum Capacity (approx.)
	Length	Breadth	Depth	
	Inches	Inches	Inches	Lb.
Chicken and Fowls				
Under 1½ lb.	21½	11¾	3½	20
1½–2 lb.	22½	14	3½	24
2–3 lb.	24½	15¾	4	36
*3–4 lb.	26	16½	4½	48
*4–5 lb.	27½	17¼	5¼	60
*5–6 lb.	29½	18	6	72

Boxes for birds of the weights marked with an asterisk may also be permitted in half sizes suitable for half a dozen birds. In that case the box must be of the same breadth and depth but only half the specified length.

Note. For poultry weighing over 6 lb. no special provision has yet been made, but the Ministry will consider the prescribing of suitable sizes in the light of experience.

This scheme for the grading and packing of table poultry under the National Mark introduced by the Ministry of Agriculture and Fisheries in 1930, after approval by the various sections of the industry, has done much to assist producers of table birds in the better marketing of their supplies and to widen existing markets; but, as the Ministry points out, producers must realize that there are three problems which they must themselves solve. Firstly, a better type of bird must be produced. Secondly, the produce must be placed on the market well-conditioned and pre-cooled; and it is also important that the bird should carry the maximum proportion of flesh to offal if it is to realize the highest price. Thirdly, the poultry should be prepared, i.e. killed and dressed, in a manner suitable for the distributing trades.

Packing goes much farther in the actual selling of table poultry than many producers appear to realize. True, the consumer may perhaps never see the packs which arrive at the market, because he buys from the retailer, who is supplied by the wholesaler or market salesman; but it is only reasonable to suppose that, if the latter receive the produce in such an excellent manner as that which is set out under the National Mark, it means much less labour for him in handling and this should reflect in better prices to the producer. Of course, it would be folly to imagine that packing is the only thing required in the way of obtaining satisfactory returns, because the contents of the package must be of dependable high quality—the chicken must be as near perfection as it is possible to attain. It is a great mistake to pack second-grade chickens in first-grade wrapping; and yet I am afraid that some producers do attempt it. If the right prices are to be realized, then perfection in packing must run hand in hand with perfection of contents. Get

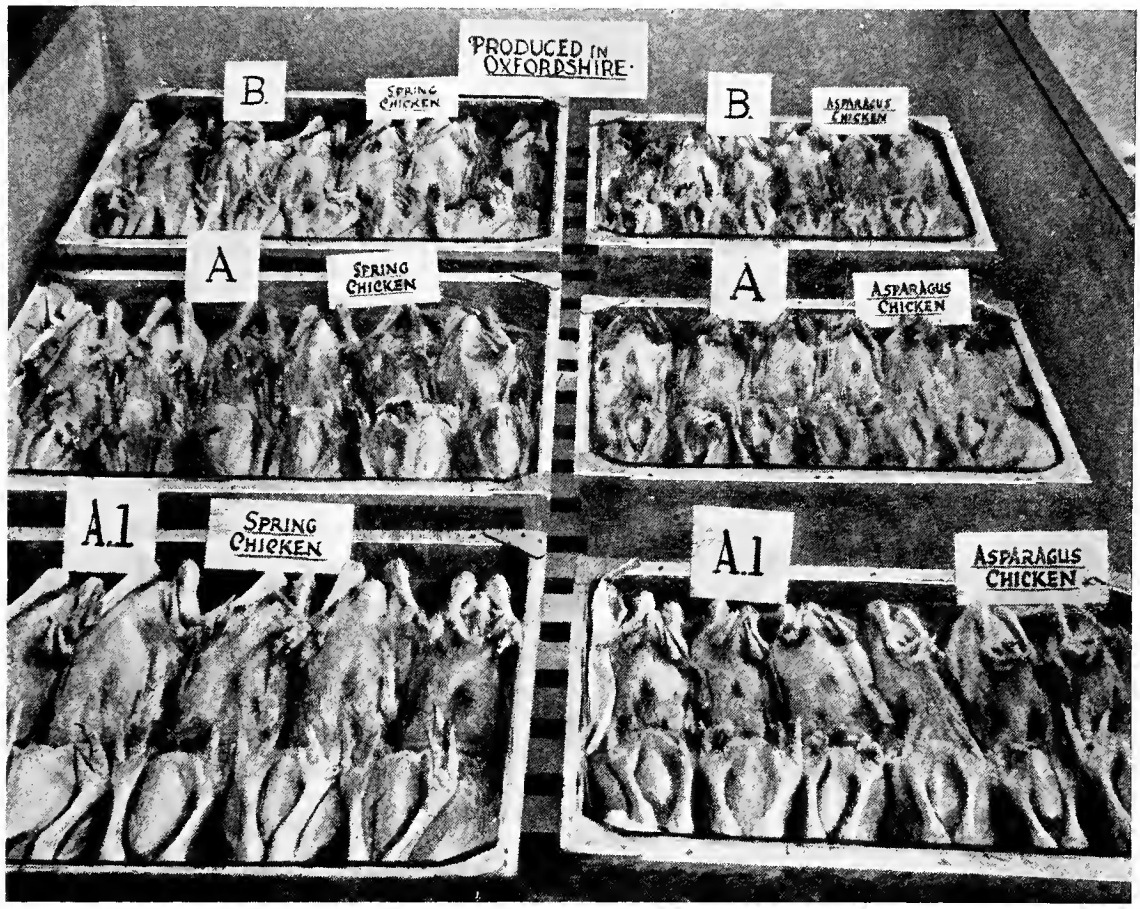


FIG. 199. MARKETING TABLE FOWLS

Specimen standard packs for home produce, as recommended by the Ministry of Agriculture

the quality of the bird first, however; then perfect the packing of it.

Capons and Caponizing

Earlier in this chapter I have referred to capons. The term "Capon" should be reserved for desexed cockerels of extra fine quality and not be applied indiscriminately to large Country or Surrey chickens

FIG. 200. A CAPON WITH CHICKENS

A caponized White Wyandotte cockerel with a brood of chicks which he is "mothering." For the brooding of chickens, capons are often equal to the best clucking hens

as at present. Caponizing is the operation for the removal of the principal organs of reproduction from the male—the testicles or testes. The operation is performed on numerous animals, but it differs considerably in that the testes of a bird are situated inside the body. The object, in the case of animals and fowls bred for consumption, is identical. When a cockerel is transformed into a neuter or an unsexed male it cannot, of course, be used for breeding purposes. The advantages are, however, numerous. The chief are that capons have no sexual instinct and so can be grown-on with the pullets; they grow quickly and to a larger size than ordinary cockerels; the flesh remains as tender as that on a chicken; and, although growth is rapid, the birds do not eat so much as ordinary cockerels, and much greater weight is gained per pound of food consumed. The demand for capons is particularly good round about Christmas when large, fleshy, tender fowls are wanted—large cockerels are also available at Christmas, but since they do not fulfil the necessary conditions they realize a lower price per pound.

Caponizing is a very simple operation; and after the first two or three attempts there is no reason why the poultry-keeper should not be able to perform it rapidly and with a loss of not more than 1 per cent. It is sometimes suggested that a dead bird should be used for the first attempt; but this is not advisable, because the operator is just as much at sea when he tries his hand on a living specimen as if he had never performed the operation at all.

Various appliances are required. A good set of

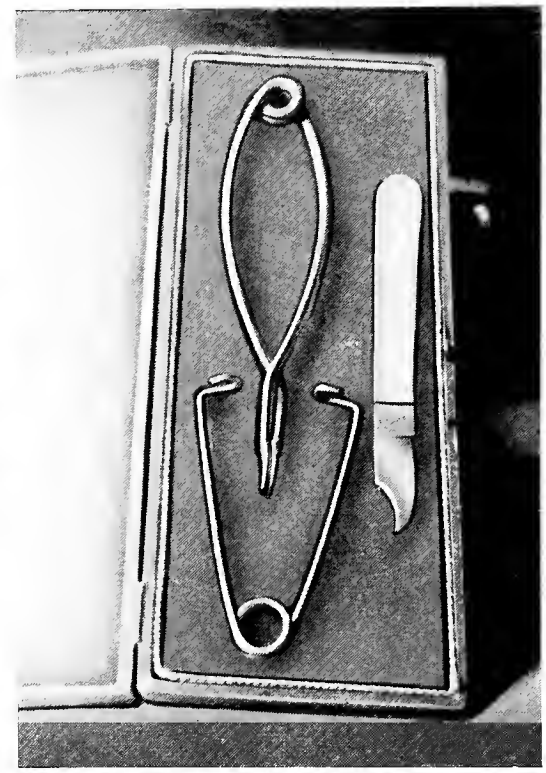


FIG. 201. INSTRUMENTS FOR CAPONIZING

On the left, spreader (bottom) and extractor (top), and (right) knife, all the instruments one requires to castrate a cockerel

instruments is essential; but this is not a serious item, since the best that can be obtained—from the viewpoint of ease in handling—cost only 10s. 6d. The instruments are knife, spreader, and extractor. The remainder of the articles needed can be found in the house. They are a table about 4 ft. by 3 ft.; a bowl of cold water; two clean cloths; a few match stalks with a little medicated cotton wool twisted round one end of each; two pieces of stout string, about 2 ft. 6 in. long, with a running noose at all four ends; two half bricks or something of a similar weight; and the necessary hampers in which to place the birds after they have been operated on. The best age for caponizing a cockerel is between ten and twelve weeks. Younger or older birds should not be

used. A cockerel of the age mentioned does not carry a great amount of flesh, while it is vigorous enough to stand the operation. The testicles are quite large enough to see, but not so large that they have become active. It will be realized that cockerels of general-purpose breeds are the most suitable, since it is only they which grow sufficiently large to warrant the trouble and the expense of rearing them for eight or nine months. The birds should be fasted for twenty-four hours before being operated on.

FIG. 202. CAPONIZING A COCKEREL (1)
Preparing for the operation. The cockerel secured on the table, with the feathers removed to expose his ribs

Before caponizing the first bird it is necessary to know exactly where the testes lie. They are attached to the backbone, one on each side rather nearer the rear than the centre. The ribs spring from the backbone and follow a backward course at an angle of about 60 degrees from the backbone. Then they make an almost right-angle turn and take a forward direction. When an incision is made between the two ribs nearest the tail, and between the backbone and the right-angle turn of the ribs, the testes lie practically in line with the cut. One or two birds should be handled so that this rib formation may be noted and the last rib found quickly and easily. When the bowl is filled with water as cold as it can be obtained, and everything else is ready, the first bird may be prepared for the operation. A weight (the half brick) should be slipped into the noose on one piece of string, and the other piece treated in a similar manner. The bird should be taken out of the basket and the free noose of the first piece of string slipped over the legs and tightened above the hocks, the second piece being used in the same way to secure the wings—at their base. The half bricks should be passed gently off the table, one at each end, and the bird laid on its side.

The Operation

With the table placed in a good light the operator should stand so that he faces the breast of the bird. He should then proceed as follows: Find the exact location of the two last ribs; soak the feathers on and round the area with cold water; pluck out a few feathers so that the skin covering the upper part of the two last ribs is bare—the remaining feathers close to the operating area will keep out of the way if properly wetted. Take the knife and, with the blade pointing toward the breast, insert it to a depth of about half an inch between the last two ribs and close to the backbone; then cut through the skin and flesh between these ribs until the angle of turn is reached; and remove the knife. Place in the spreader so that the opening is extended. Sometimes a skin may be seen underneath the cut; if so, it should be cut through. In most cases, however, it is cut at the first stage of the operation. One testicle will be seen lying close to the backbone. Grip this in the forceps or extractor, give a half turn and pull out.

This part of the work must be done very carefully, for two reasons. A large blood vessel lies close to the testicles; if severed the bird bleeds to death. Unless the whole of the testicle is extracted the bird will not be a true capon, although it may still be unable to fertilize any eggs. Remove the spreader. The wound will close of its own accord, owing to the spring of the ribs; no stitches are necessary, nor are they desirable. Some birds are more full blooded than others. If the work of extracting the testicles is impeded owing to the presence of a little blood, this can be soaked up by means of the cotton-wool-tipped match stalks. Turn

FIG. 203. CAPONIZING A COCKEREL (2)
Showing the first cut between the last two ribs

the bird over on its other side and extract the second testicle in exactly the same way. It is possible, but only after a great amount of experience, to extract both testes from the same side; but this plan is not recommended.

After the operation the birds should be kept in hampers or coops or a small house with plenty of clean, dry straw litter on the bottom for three or four

days. A small meal of hard grain may be given at once, together with a little drinking water, and this should be the rule for the next three or four days—about four small meals *per diem*. A large meal would tend to distend the body and so retard the healing of the wound. In five or six days the wound is just visible; in a month there is no trace of it. The only after-trouble which is likely to be encountered is that the skin on the side of the body may puff up with wind; but it is not serious and can be cured by pricking with a sterilized needle. This does not happen

FIG. 204. CAPONIZING A COCKEREL (3)
Showing the incision held open by the spreader, and the extractor about to be used

after the wound has healed, and only occasionally during the first day or two after the operation. Before and after the operation the instruments should be sterilized in boiling water.

It is imperative that the cockerels be fasted for at least twenty-four hours before the operation is performed; and they should be confined in a clean and airy coop or room without food or water. The best time to begin is at noon, as their fast will then end at a time at which the operation is best performed, viz. noon. It is preferable not to caponize them on a cloudy or wet day, because it is necessary to have all the light possible in the matter; but if the birds have to be held over they may be given a little food or water if necessary. However, it is much better to avoid this if possible, as it is very desirable to have their intestines quite empty, thus allowing their testes to be more readily seen, besides giving the operator much more room in which to perform the work.

When capons are ready for marketing they should be fasted and killed in the usual way; but a difference is sometimes made in the dressing or plucking. The head, of course, must not be removed as it is a distinguishing feature of the capon; but the neck and saddle-hackles, the tail, the feathers of the legs from the hock joint half-way up, and those of the upper joint of each wing are sometimes left on, the other parts of the capon being dry-picked. Capons should not be drawn when dressed for market; and while some producers cut carefully around the vent and "rope" the carcass, turning the fat around the opening slightly outwards, such dressing is not, as a rule, favoured by salesmen, so that, beyond cleaning the vent and the feet, nothing more should be done.

Those who are experienced in handling table poultry can instantly distinguish a capon by the appearance of its head and legs, because the comb and wattles cease to grow after the bird has been operated upon, and the spurs do not develop as in the entire cockerel; but extra large and super fatted "Surreys" are sometimes sold as genuine capons to the uninitiated.

The Value of By-products

In every industry there are by-products which, although apparently of little account, are valuable when utilized in the right way. In the poultry industry, owing to lack of organization, by-products have generally been wasted in this country, feathers being burned or dumped in the rubbish pit, and manure being thrown out of doors to be spoiled by the weather. Happily, some poultry-farmers discern means of utilizing both products, so that, while feathers have become a saleable asset, manure is being utilized as a fertilizer. It will be seen, therefore, that poultry-keepers who do any considerable trade in table birds have other sources of income beyond the sale of chickens. When the work is being undertaken at home the feathers should be roughly sorted while the birds are being plucked; and in the case of fowls this can be accomplished by having a couple of dry boxes or barrels handy for their reception. That this will be done with much care is rather more than can be expected when the birds are killed and dressed by labour employed specially for the purpose "by the piece," the feathers in this case generally being left where they fall. Nevertheless, such rough sorting should be encouraged among one's own employees, as it is certainly done by some old hands who have done plucking for me in exchange for the feathers.

Poultry feathers should be graded into three lots, viz. (1) down, (2) soft, and (3) quills, i.e. tail and stiff wing feathers, and the last-named are generally thrown aside as they are not of much account. There is little down on fowls in the usual way, but I have plucked some particularly feathery standard-bred young (and old) birds for home use, which have had almost as much down as feather. White feathers, which fetch more per pound, should be kept apart from coloured ones; and when other classes of table poultry are being dealt with, fowl's feathers should be

kept separate from those of ducks and geese, as the latter are of much greater value. It is important to see that all feathers to be sold are clean and dry, although there is no need to cure them if they are to be disposed of to feather merchants, because they go through thorough purification and preserving processes in the factory before they are fit for industrial purposes.

Preparing Feathers for Home Use

Should it be desired, however, to use the feathers at home for making cushions, the following process is well worth using: Remove from the collection any that are large and coarse, and those having very stiff quills. When the selection has been made, place the feathers in a large wooden tub—the shape known as a "washing tray" is best—and pour over them a sufficient quantity of lime-water to cover them to a depth of several inches. The lime-water should be prepared by adding quicklime to water in the proportions of 1 lb. to a gallon, stirring it well, allowing it to settle until clear, and syphoning off the solution.

When the feathers are thoroughly wet, stir and knead them in the lime-water, and leave them undisturbed for two or three days. Next pour off any floating impurities by tilting the tub; and drain the feathers carefully in a sieve or on a wire frame. Plunge them repeatedly into water, both hot and cold, and dry upon stretched nets of a mesh large enough to permit the feathers to fall through when shaken in the process of drying. Moderate heating will complete the evaporation of moisture; and feathers so treated will be free from oil. Pack the feathers loosely in large muslin bags, and keep them in a perfectly dry loft or other suitable place. It is a good plan to suspend the bags from beams, in order that the air may circulate around them. Periodical inspection should be made to see that they are free from moth.

Prices depend very much upon quality and condition, and also, to some extent, upon the quantity offered. The best prices are made when dealing direct with firms of feather purifiers; but since they seldom care to take small lots, and stipulate for quantities of not less than 1 cwt., one has to be in a very large way as a producer (and killer) of table fowls before direct sales can be made, as it takes something like 1000 chickens, and more rather than less, to provide such a weight of soft feathers. In some districts, however, there are travelling collectors, while some dealers in dead poultry are regular buyers, as there is a ready market for feathers. In this case, therefore, the producer should carefully collect and grade the feathers, and store them in bags in a dry place.

Utilizing Poultry Manure

Poultry manure is not so easily dealt with as regards marketing; and although fruit growers and market gardeners will generally pay a fair price for it if properly stored, more often than not it pays to barter it with a neighbouring farmer in exchange for straw. Poultry droppings have a manurial value far higher than ordinary farmyard manure. When fresh they contain some 2 per cent of phosphate of lime, and a small amount of potash, and these percentages are considerably increased when the droppings are dried. If mixed with litter and stored in heaps the manure generally heats, the ammonia or nitrogen being wasted in the warm pungent odour which arises from this "heating"; and such manure is of little use. The best way to "fix" the ammonia is to sprinkle the droppings' board with dry soil, peat moss dust, or gypsum, which dries the evacuations and seals the ammonia, so that it will not escape until subjected to the dampness of the ground. Dryness is essential; the manure can be spread out on shallow trays or in wooden boxes, and submitted to gentle heat if sunshine is not available. It must be protected from rain; and the best place in which to store it is a dry loft, or some such building where there is ample air, keeping it spread thinly over the floor.

A complete fertilizer can be prepared by mixing 1 stone of dry poultry manure—sifted of feathers, straw, and other unwanted matter—with $3\frac{1}{2}$ lb. of one of the soluble potash fertilizers, such as sulphate of potash. The material should be used as a dressing for gardens and allotments during spring and summer, at the rate of about half a stone to the square rod. As a liquid manure for stimulating plants in the greenhouse during winter, and outdoor flowers, fruit and vegetables during summer, 1 peck of fresh (undried) poultry manure—or half that quantity of dried droppings—should be dissolved in a 40 gallon tub of water; and let it be freely used after a previous application to the plants, etc., of plain water. The best way to make this liquid manure, so that it will flow readily, is to put the droppings into a coarse bag, which should be suspended in the tub.

On the subject of the uses of poultry manure, I have been informed that an effective substitute for stable manure can easily be prepared by combining fowl droppings and spent hops (obtainable from a brewery) in the following manner: Spread the spent hops on the floor of a shed and throw over them half a dozen good handfuls of the fresh (undried) poultry manure. Then dissolve 1 peck of the latter in 40 gallons of water and thoroughly spray the spent hops with the liquid. Another layer of dry spent hops should then be put on and treated similarly; and when all has

been dusted and watered in the manner indicated, a stack should be made out in the open ground, this being covered with soil and allowed to decompose for about a couple of months. A few barrowloads of this per square rod will be found a most useful means of solving the manure problem. The authority who suggested this method also advised adding potash —about a quarter of the weight of poultry manure— to make "an absolutely complete liquid manure."

It must be admitted that, on the ordinary poultry-farm it is not an easy matter to collect a ton of the droppings, although that which is taken from battery brooders, and from under slatted floor houses and the fattening pens, should not be difficult to deal with, if a good storage place under cover be available. It is impossible to powder it when it has been dried; hence when it has to be stored in sacks it should be granulated. An attempt to powder it, carried out under my supervision many years ago, had a most detrimental effect on the men operating the crusher, and it had to be abandoned. However, it is doubtful if it would pay the average poultry-farmer to produce a really finished product, while I question if any substantial outlay in the first place on special equipment for drying the manure would prove a sound investment. That some good use should be made of it there can be no doubt, because it has been estimated that 1000 fowls will produce about 1 cwt. of manure *per diem* in the houses and a similar quantity outside, while even more can be collected from birds cooped for fattening.

Disposing of Old Hens

There is yet another source of income for the producer of table fowls, if he runs his own breeding stock and does not depend upon supplies of day-old chicks from the hatcheries; and small though the profit may be, every mickle makes a muckle, as the wise Scot would suggest. In such circumstances, therefore, he should make something of the birds when the breeding season is over, before the moult sets in. Admittedly, the cocks which have been in use will probably be fit only for soup, although it has often surprised me to find what a good cook can make in the way of tasty dishes with nothing better than a tough male fowl as the only meat. However, some of the stock hens may have put on fat and be heavy enough for sale in connexion with the Jewish festivals, while I am told there is a demand for such fowls by certain ships' caterers. For the latter purpose large quantities have to be dealt with; but as long as the hens are genuinely fat and not dropsical, and are sold alive, they can often be disposed of profitably for the festivals mentioned. In some localities there are regular buyers of such hens in small lots; so the birds might well be got rid of in that way, unless private consumers can be found for them. As the hens are of the general-purpose kinds they can be dressed to please the eye; and I can assure readers that they will please the palate, also, when properly cooked.

Large-scale Production

I have said that I am not altogether in favour of producing table chickens on factory lines; and it is certainly not a method which can be successfully adopted by the novice. Of quite recent times, nevertheless, plants have been established in England at which large-scale operations are in vogue and where chickens are reared from the shell in batteries and finished in fattening cages without going outside the building or exercising on the floor; and at a poultry-farm not many miles from London one section is devoted to table chickens on this system, as many as 1000 *petits poussins* being dealt with weekly during the season in which the demand for that class of table bird exists. As can be imagined, considerable skill is required to make it successful.

The rearing of chickens in batteries for the first three to four weeks after they are hatched does not present too many difficulties to the attendant, provided he begins with healthy birds and knows how to avoid poor feathering, cannibalism, leg weakness, and other set-backs of a similar nature; but carrying them on in these unnatural conditions until they are of a size and weight to be sold as chickens rather than *petits poussins* is by no means a simple problem. Even if all has gone well, trouble may arise the moment the birds are ready for the market, because when they have reached the proper stage in accordance with the breed they must be sold. Every additional day they remain in the battery they are "losing money." Moreover, the day-old chicks, which arrive regularly by contract or from the incubators, make it imperative to market those which are ready because in a properly proportioned installation there is no room for a surplus batch.

These large-scale operations must be run solely for keeping the markets supplied; but there is sometimes a difficulty in finding a steady market which is remunerative to the producer. For him a retail trade is usually outside his possibility, while sales to restaurants and hotels offer unexpected difficulties—one must supply all the chickens they require on any day, and to suggest to them to purchase part of their extra requirements elsewhere is out of the question if it be desirable to retain their custom. The capital required is much larger than is generally estimated; and not all who attempt the battery rearing of table chickens make a success of it—some, in fact, have gone bankrupt before having raised the first bird

ready for market. Some purchase infected chicks, or the birds contract a disease through carelessness or improper ventilation. Food ill-proportioned for the stage of development will produce poor chickens, or the birds will cost too much through having to be kept too long in the batteries before they are fit for sale; or, again, the output may be too small to carry the overhead expenses of hired labour.

Such are what may be termed the snags of the system; and yet, the rearer who put them before me had to admit that, circumstances all round being favourable, the raising of table chickens in batteries is as good an investment of capital and labour as most other enterprises in these difficult times. And there I will leave table poultry production for the moment, because it is a subject on which I shall deal further in the next chapter. Suffice it to say that it is a branch of the industry in which the novice can participate with success, if merely as a means of disposing of his surplus cockerels. But, as in most other business enterprises, he must learn to walk before he attempts to run. Begin in a small way, and do not try production on a large scale until experience and confidence have been gained.

CHAPTER XI

THE POSSIBILITIES OF POULTRY-FARMING

POULTRY-FARMING can be made to yield sufficient profit to enable a shrewd man to obtain a good living from it, while a decent rate of interest can be secured on the capital invested. It was over thirty years ago when I first made that statement in a handbook which continues to be in steady demand by beginners; and despite changed and changing times, nothing has occurred to make me withhold one word of it. I am as firmly convinced to-day, as I was then, that there is money in poultry-farming. Without taking into consideration the failure that overtook several of the ventures which sprang into being all over the country during the few boom years immediately following the Armistice—affairs started on a large scale by inexperienced people as a result of the abnormally high prices then being obtained for eggs, and which were bound to fail as soon as things had settled down once more—I maintain that a properly managed poultry farm will always be able to show a profit. Proof of this is seen in the number which are firmly established after the depressing years through which this country has passed, and the fact that poultry-farming has not lost its power to attract new adherents with the object of making it their means of livelihood.

There will always be a return for the man who understands the business, because poultry and eggs are not new articles of diet—they are in daily use all over the world. It is merely a matter of one's fitness to produce and market that which is in demand. Poultry-farming in its various branches offers a good living and something over for those who are business-like and energetic, and have taken the pains to learn the trade before embarking upon it; but it is no asylum for the idle and improvident.

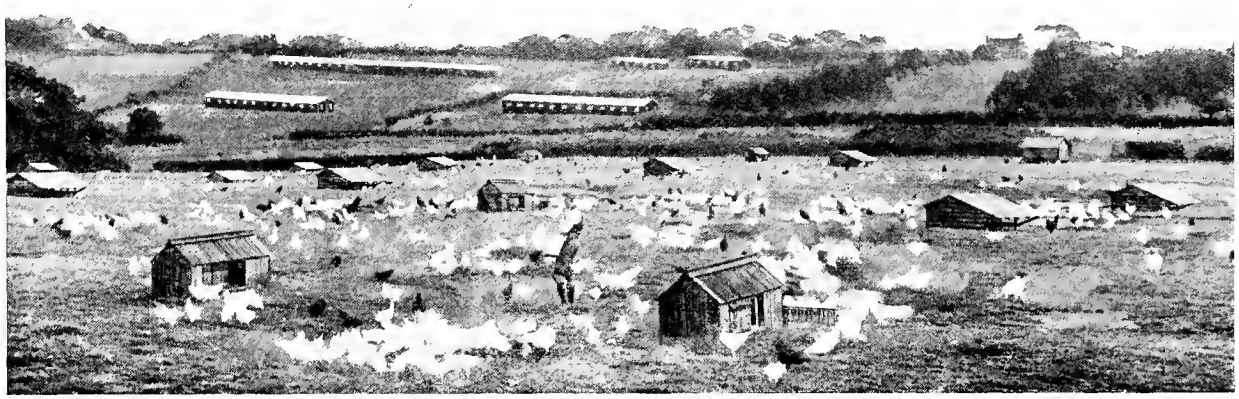


FIG. 205. ON MESSRS. JOHN H. DOWDEN & SON'S POULTRY FARM, AT HEYDOWN, HEATHFIELD, SUSSEX

This photograph and the ten which follow give the reader an excellent idea of an up-to-date poultry farm, at which pedigree breeding, rearing, egg production, and table poultry production are carried on on an extensive scale. The farm is one of the most complete in England, no less than eighty acres being devoted entirely to the poultry

A panoramic view of the farm, showing one of the free range rearing fields in the foreground, and trap-nesting and laying houses in the background. The houses used for the young stock are Sussex night arks and a new type of rearing house

Every business must be mastered before success can be achieved. Just why poultry-farming should be looked upon as something to be taken up with no previous training is hard to conceive. Any business dependent upon live-stock needs exceptional management; and the smaller the stock and the greater the numbers in which it has to be kept, the more experience is required. Poultry need more care and attention to detail than many people have patience to give; and they also suffer sooner from neglect than large stock. Admittedly, there has been a good deal of money lost in poultry-farming; and this from several reasons.

One is that people will start in too large a way without previous experience; it is useless for a man to go into any business on a large scale until from his experience he is fully convinced that he understands it, that he has confidence in his own capabilities, and that he is sure of his markets for buying and selling.

It is a noteworthy fact that practically all the large successful poultry farms in this country began in a small way and were gradually built up. I have watched the growth of several of them; but although mistakes have been made by their owners at first, they have gone steadily on, learning from that best and hardest of teachers—experience. All businesses fail when people rush madly into them without some kind of apprenticeship; so why should poultry-farming be exempt?

The best advice I can give to a young man who has an inclination for poultry-farming is for him to spend a year as a pupil on a successful place, learning from a practical poultry specialist who is getting his living at the trade, where little or no paid labour is employed, and where the profits are derived almost entirely from poultry produce; and then, if he feels he can stand the life, let him go as a paid working poultryman for a year, after which he should be fit to start in a moderate way and work up. I know well enough from my long connexion with it, that the novice is too apt to imagine that, because he has made a score of hens pay in his garden, he is fit to manage hundreds; but the difficulties increase with the square of the numbers kept. And yet, anyone who does make twenty fowls pay on strict business lines should do the same with a thousand, but only provided they are kept under similar conditions to the score and have equally good management. It must be remembered that keeping a few hens in a garden, where rent and labour are free, and much valuable food in the form of house scraps is available for nothing, is vastly different from farming a thousand head of layers on land for which rent has to be paid, when labour costs must be taken into account, and when practically every pound of food has to be purchased.

Another reason why poultry-farming so often fails is that, when development is such that assistance is necessary, it is by no means easy to find anyone who, being paid the standard agricultural labourer's wage, will take the trouble required by stock which must have daily, nay hourly, care. There are few poultry-farmers working along moderate lines at the beginning whose scope is such that they can afford to employ fully-trained managers. Hence, unless they are fortunate enough to have the assistance of one or other member of the family when the most important part of the work, viz. the hatching and rearing, has to be done, they are severely handicapped, and other branches of their activities may suffer in consequence. This has been one of the difficulties on large poultry farms of the past; many of them had to depend upon men whom they had trained up from boys. There is perhaps an improvement in this direction to-day, because young people are being trained at agricultural colleges, and some of them take a keen interest in it.

FIG. 206. A MAMMOTH BROODER HOUSE

The Capital Necessary

Then, again, there is the question of capital, although even that amounts to little if there is not an experienced brain to direct it along the right channels. Where so many novices have made a mistake is to start without working capital. Every pound they possess is invested in stock and houses; but the almost inevitable result is that they soon get into debt for food and the necessities for operating the farm.

Now, at least a quarter of the amount available at the commencement should be retained for working

capital. This may not be so when one begins with poultry as a side-line to some other occupation, or when one is in the very fortunate position of possessing an income independent of the new business; but there must be money to purchase the food until an income is produced, while rough help may be required, and that means wages. Laying hens cannot produce eggs without food, while chickens cannot be reared without money. It is not the most difficult matter these days to run up food bills, as there are suppliers who appear to be anxious to get customers on their books without much, if any, security; but when the live-stock on hand is heavy, and especially during the chicken season, their requirements amount to a considerable sum, and almost before one realizes it there is a large debit to be met. Moreover, where long credit is allowed it can hardly be expected that supplies can be obtained at rock-bottom prices, while there is little hope of securing the bargains which are picked up by those who pay spot cash.

FIG. 207. A CORNER OF ONE OF THE REARING FIELDS

Choosing a Site

However, there are other things which must be combined with capital if success is to crown one's efforts. There is the matter of land, which is an important factor in poultry-farming. A few years back location was said to be the chief consideration, and it was thought essential that the farm be situated in close proximity to one of the several markets for which the farmer was catering. It is not so necessary now. The excellent facilities by road and rail which are available to-day make it possible for a poultry-farm located several miles from a city or town to reap the benefits of the top prices there prevailing to as great an extent as one which is situated within the proverbial "stone's throw." Provided that the object of the producer is to send his supplies to the big markets, the cost of conveyance is easily offset by the reduced cost of running the farm on land which is not highly taxed. But, as I mentioned in the preceding chapter, the country markets are well worth catering for, as are retail shops and private buyers. Farms which are established on a sound basis and are conducted in a systematic manner by experienced men are bound to be successful even if they are more or less inconveniently located, although, on the other hand, the best location in the world will not bring success to a poorly-managed affair.

Much more essential than the actual district is the site of the farm itself, that is, the nature of the soil, the lie of the land, its position as regards sun, winds, drainage, and so forth, as mentioned in Chapter II. To show how very easy it is to make a mistake when selecting a site, I may mention that a section of the land on which my brothers farmed their fowls in Buckinghamshire was on the side of a hill, an excellent place for drainage; but as it faced in a south-easterly direction, the birds failed to get the benefit of sunlight as long in the afternoon as they would have done had it faced south. Then, too, the water supply must be considered; and, after the disastrous experiences of 1934, when there was a great shortage of rain during most months in all parts of the country, it is a matter which requires particular attention when deciding on poultry-farming. There are places, such as the one I am now occupying, where main water is available from standpipes on the field, which is a decided convenience compared with those at which the water for the stock has to be drawn from well, pond, or stream. When, however, any of these is lacking it will mean storing water in tanks, above or under ground, catching rain from the houses, and cleansing it with lime, all of which adds to expenses.

Qualities Making for Success

Still another cause of failure is the fact that not everyone who understands poultry is cut out for poultry-farming; hence those who contemplate taking

it up as their livelihood should go carefully into every point before making a start. The man who stands the best chance of making it a profitable undertaking—granted the capital, and the capacity for laying it out to the best advantage—is he who has a sound idea of the business side of it, practical knowledge of the elementary parts of the work, a strong constitution, a cheerful disposition, and a real flair for work. He must know how to deal with people, how to be courteous, when spread over a year—a layer consumes, roughly, almost that quantity of food in twelve months—but it represents a fairly big percentage to deduct from the hen's profit.

In the matter of selling eggs, the newcomer may find it difficult to dispose of them at the top prices; and even if he fall short by only a penny a dozen—it may be twice that amount, or more—it is the pence which make the pounds, and that penny amounts to

FIG. 208. AN INTERIOR VIEW OF ONE OF THE BROODER HOUSES, MEASURING 250 FT. BY 25 FT.
It is fitted with twenty-five blue-flame hovers, each of which accommodates 500 chickens

prompt, tactful, and at all times honest, and ambitious to build a reputation for himself. Poultry-farming is not a "get-rich-quick" game; but men of initiative and ability have founded very profitable concerns in the poultry world, just as those of like calibre have established good businesses in other spheres. The business side of poultry-farming includes buying and selling, the buying of stock and food, and the selling of the produce. The beginner, although well trained on the practical side of poultry-keeping, may find everything up against him at first, and especially if he be a stranger to the district. In buying food rather than stock—he will probably get the latter from breeders with whom he has already had satisfactory transactions—it is very easy to pay a shilling or two more per cwt. for meals and grain than is actually necessary. That may perhaps seem a very small sum quite a big sum when large quantities of eggs are being sold. It is very similar when disposing of table chickens; one market or shopkeeper in the same town will give more than another, which fact I know from personal experience. Even to-day, there are sellers and buyers who appear to imagine that the newly-started poultry-farmer has "money to throw away." Admittedly, in many districts nowadays there are packing stations; but they do not exist in all places where there are poultry farms, and there is still a large trade to be done by the producer in many parts of the country by dealing direct with retailers, and thus confining a percentage of the profit to one middle-man only. It takes time, certainly, to get in with those who sell food and others who buy the produce at reasonable prices; but it is just part of the business side of poultry-farming, and well worth studying.

Practical knowledge and experience are almost as important assets to a poultry-farmer as is capital; and an inexperienced poultry-keeper is no more justified in sinking large funds in a poultry farm than he would be in investing heavily in any other strange business undertaking. The conduct of a poultry business is not a simple matter of rule of thumb, which can be picked up from a textbook as one goes on; there is a very great deal to learn, and the subject cannot be mastered without practical experience. That is why I suggest that a thorough course of practical training is necessary; and let the pupil remember that he will learn more by entering wholeheartedly into every phase of the work from the ground up than by strolling about watching others do the labour—the success of his own farm will depend mainly upon his knowledge of how things are done, as well as his own efforts in the doing of them.

In this matter it would be extremely risky, in my opinion, to depend upon an employee to do some part of the work which the owner did not understand, and which he could not do as well, or even better, himself. There are very few successful poultry farms owned by people who do not thoroughly understand the business, those who are not only able to tackle any sort of job in connexion with it, but who, if not carrying out the whole of the work themselves, can capably supervise it. I have seen so many failures due solely to lack of experience that I cannot stress too much the importance of the would-be poultry-farmer learning as much as possible of the business before launching out, or at any rate studying closely any particular branch of it which may appeal to him as being worth making a special feature of the farm.

Physical fitness is necessary to enable one to stand up to outdoor conditions in all sorts of weather; an open-air life suits most folk in summer, but one requires a strong constitution to face the world of a winter's morn, when the wind is cutting or the rain is driving down, or there is slush to be waded through before the birds can be reached. Then, too, one must be of a sufficiently cheerful disposition to get through the day with a smile, no matter what adverse condition may arise; while in a large measure the poultry-farmer will have to make his own amusements, since, often enough at first, he will be thrown on his own resources. He will have to be prepared to work, and to keep at it almost continuously from sunrise to sunset, at times well into the evening also, not six days a week but seven, because the stock must be attended to on Sundays and Bank Holidays—a full seven days' week all through the year, and often more than an eight-hour day, until he is established. And that is where some are apt to fail; they tire of the sameness

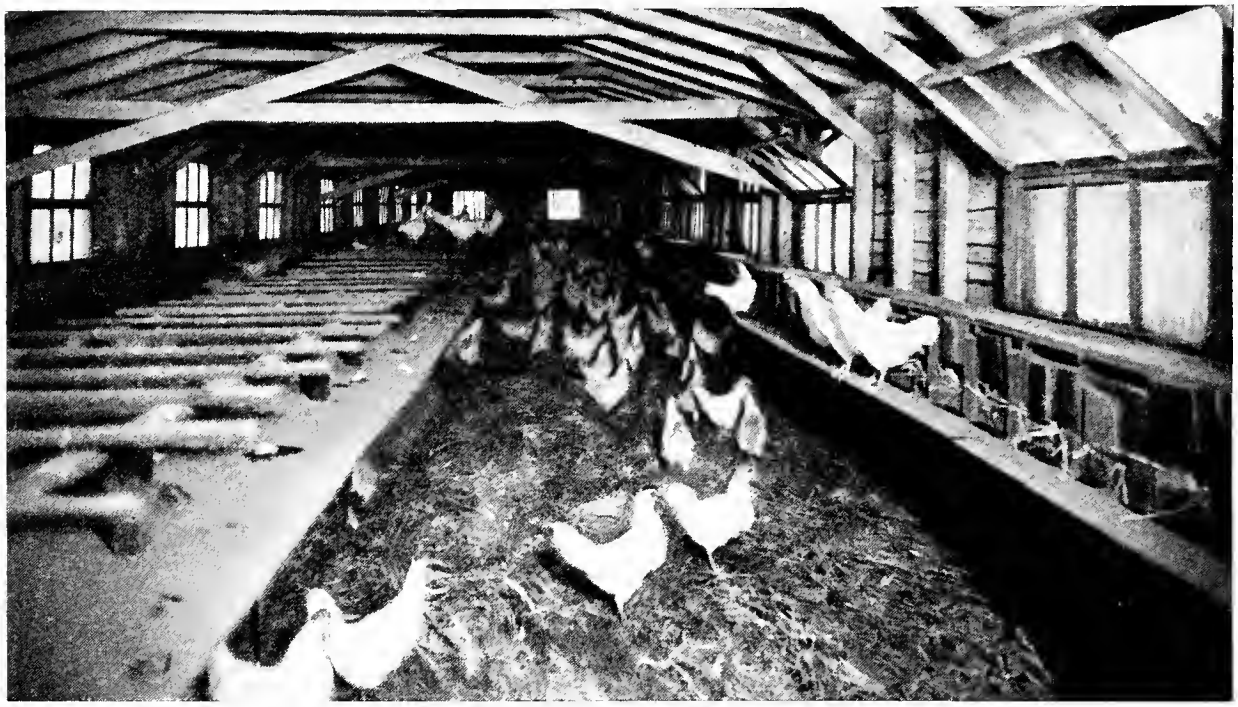


FIG. 209. AN INTERIOR VIEW OF ONE OF THE TRAP-NESTING HOUSES
It measures 125 ft. by 25 ft. and well accommodates over 1000 pullets for semi-intensive purposes

and the fullness of the work—they have not the grit to stick it.

Let me disabuse the reader's mind of the idea that poultry-farming consists of nothing more strenuous than strolling around the place twice a day to feed the hens and collect the eggs. It is hard work until one gets thoroughly accustomed to the routine, and there are so many duties to carry out that it takes time to get into the swing of things. I have mentioned these matters not to deter anyone from considering poultry-farming as a suitable means of livelihood, but to indicate along which lines to proceed to make a success of the undertaking. With all its hardships the life is a healthy one, as it builds up both body and mind; and once the farm is firmly established it will bring in more profit with less expenditure in cash and labour than any other branch of husbandry. It just means that one should go carefully into details before a start is made.

I have frequently been asked what amount of capital would be required by a man who had to depend solely on poultry-farming for his income; and I am well aware that I have disappointed many by stating that it should be at least £1000 to ensure a yearly profit of about £250 after the place is in good working order, and then only if the applicant had spent twelve consecutive months, or longer, gaining practical knowledge on an establishment similar to the one he intends to build for himself. And yet, this is so, because it would be the height of folly for anyone to embark on such a venture without capital and experience. There is, nevertheless, another way of starting, with every prospect of gaining the end in view, although it is almost invariably turned down, because to reach it takes more time than many are prepared to devote to it. However, if capital be not available to enable a beginning to be made on a large scale, it is quite possible for many who keep fowls as a source of profit in a small area eventually to develop that hobby into a poultry farm from which they can earn a living.

FIG. 210. A FIELD HOUSE FITTED WITH MASH HOPPERS (RIGHT) AND NEST BOXES (LEFT) AND, UNDER THE ROOF, AN OUTSIDE COOP FOR BREAKING BROODIES

The White Leghorn and Rhode Island Red pullets show the high quality of the stock raised at Heydown

Starting in a Small Way

Having come into contact with thousands of town dwellers who have a few hens in the back garden, and discussed matters with them, I know well enough that many of them cherish an ambition of some day being able to get away from "bricks and mortar," and retiring to the country where they can keep sufficient fowls to provide them with a comfortable living and make them independent of office, shop, or factory. That only a very small percentage of them, unfortunately, can do so is mainly due to lack of capital and opportunity.

There may be people who have made a fortune out of poultry; but, so far, I have not met the man or woman who has done so out of poultry-farming, even in the boom years, and it is certainly not possible nowadays. The best that one can make is a comfortable living, the "comfort" of that living depending to a great extent upon the amount of capital invested and the manner in which the farm is managed. There are poultry farms in existence to-day which have grown to their present size from a small pen without the investment of a single penny of capital

other than that derived from the profit obtained from the fowls. I call to mind a case which came under my notice quite recently. A man on the wrong side of forty, after many years of business, was retired through no fault of his own; and so, having some experience of poultry, and convinced that brains and work would eventually give him a reasonable living, he took up poultry-keeping as an occupation in which he could work to his own advantage. Commencing with 150 stock birds, he worked up, within eight years, to a poultry farm with an average stock of 3000 head. Starting in a small way, he increased as he found his markets and with the profits he derived from the birds.

That is, perhaps, exceptional; and yet what has been done in the past in this direction can quite as well be done to-day or in the future. Of necessity, the change from hobbyist to poultry-farmer must be a gradual one and take some years to accomplish; but those who keep this object in mind and use all their profits for development will be surprised at the progress they will be able to make in a very few years. Progress must be slow, when compared with the beginner who can command a considerable capital as soon as he is ready to launch out; but, in the former circumstances, valuable experience will be gained before operations are carried out on a large scale, while since he has had to make his capital as he proceeds, he can scarcely lose money should anything unforeseen occur.

Although the small poultry-keeper cannot purchase his foodstuffs and appliances as cheaply as the poultry-farmer, he can generally dispose of his produce at better prices by selling direct to consumers and to retailers; and he will probably be able to develop much of his trade along those lines as his flock increases. It should also be possible for him to branch out in other directions during the years in which he is building up, and include the sale of day-old chicks and eggs for sitting; hence, he will have acquired a valuable business connexion by the time his farm is established.

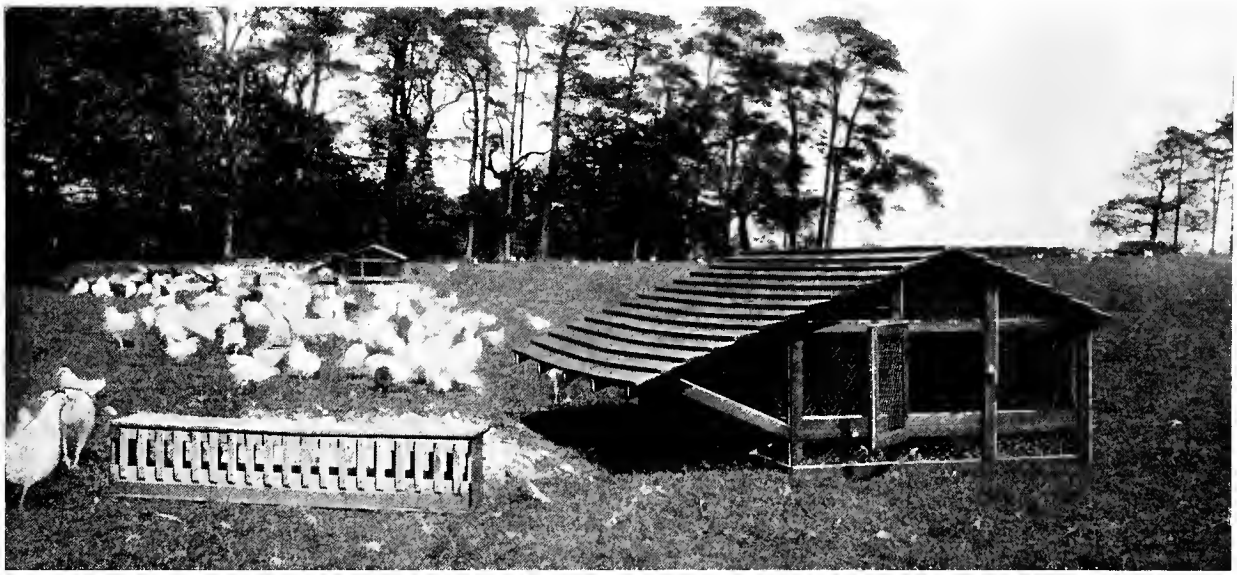


FIG. 211. ONE OF THE NEW TYPE OF REARING HOUSE, WITH A FOOD HOPPER

The floor, front, and one side of the house are made of small mesh wire-netting, while the extended roof affords excellent shelter for the birds

Gaining Experience

It must be admitted, of course, that every small poultry-keeper has not the opportunity of extending his scope as he desires; but many such of my acquaintance, living in the London postal districts, have built up quite considerable poultry plants as regards the sale of new-laid eggs and an occasional fowl for the table, while one of them, residing in a somewhat densely populated suburb, has developed his few fowls into an intensive "farm" from which he derives an income that will soon enable him to live in the country and begin poultry-farming proper. In suburban districts, in which there are no restrictions against the keeping of fowls, it is quite possible to run a large number of layers on the intensive system in a back garden; and I have seen several such places in which a hundred or more pullets and hens are kept in splendid condition, while there is often allotment land which could be utilized in a similar way. It is

certain that keeping fowls in those circumstances enables one to gain valuable experience, particularly if strict accounts are kept; and such experience will be of considerable service should the opportunity arise for developing a poultry farm.

The fowls will have to be considered as a hobby until such time as they show sufficient profit to convince their owner that they will provide him with a living; but from the commencement they must be regarded as entirely distinct from his daily occupation.

FIG. 212. THE RESULT OF TWO DAYS' WINTER EGG PRODUCTION

This will make it necessary to keep a strict account of debits and credits in connexion with them. In this direction one might note down the time taken in attending to the birds, although it will scarcely be possible to work it out as a cash item, i.e. to include it as part of the cost of running the hobby, when making up the balance sheet each year. And the same may be said of the ground they occupy, unless a plot of land is rented specially for the fowls. They must be run as an item on their own, the profits from them not being included as part of their owner's income, but as capital to be invested in further stock and appliances.

Admittedly, it is easier to write about building up a poultry farm out of profits alone, than to carry it out; but the will to win goes a long way towards helping one to accomplish the end in view. It has been done, and I have had ample proof of it from novices who have sought my advice on the matter; and that should be good enough to encourage others to attempt it. During the early stages progress will be fairly easy and simple, and difficulties are not likely to arise until the flock has increased to such an extent that fresh quarters must be found for the birds. This will be a critical stage, because it is the beginning of the poultry farm; it will probably entail a change of dwelling, while the stock will require more and more attention. However, when that time arrives, the poultry-keeper should be in a position to know, from the experience he has gained and the success he has achieved, whether his special circumstances are such as will warrant his changing the hobby into a poultry farm or not. It is a matter which he alone can decide.

I have already mentioned what has been accomplished by one man using his brain and working hard—a farm of 3000 fowls within eight years from a start with 150 stock birds. This is an excellent achievement, even though it represents an increase of not much more than 50 per cent each year. I can assure readers, however, that it is possible from a start in a small way, with as few as two pens of fowls—each consisting of ten second-season hens and a vigorous young male bird—to build up quite a modest poultry farm in ten years entirely from the profits from the birds; but it is possible only to those who have sufficient grit and enthusiasm to stick to their object and work always with that end in view, in face of all obstacles and set-backs.

A Basis on which to Begin

Taking the score of hens as the basis, and assuming that the laying stock is increased by 50 per cent each year, it would mean that at the end of the tenth year there would be a total of more than 1100 layers, which, at the moderate estimate of 5s. a head profit per annum, would represent £275. However, for the first five years at any rate, when the head of laying stock (at 50 per cent increase per annum) would not be more than 150, such a profit as an average from each bird might easily be exceeded, as it frequently is by small poultry-keepers. At the same time, it should not be a difficult matter to accommodate that number of layers on the intensive system in a decent-sized garden, and still have room for the necessary breeding pen and for chickens, while such a flock should be well within the scope of many men following their usual occupation.

As it is, progress would probably be more rapid in the early years than in the final stages; and one would have to be very favourably situated with regard to land for the fowls to reach the maximum for ten years with no more accommodation than a garden. It would be necessary by the end of the fifth year to find fresh quarters for the birds, and this would mean renting a suitable allotment or small holding, or changing one's dwelling so that the requisite amount of land could be available. I have not overlooked the fact that this increase in stock must entail the hatching and rearing of chickens; but while this could not be managed single-handed by a man who has to spend eight hours or more from home most days of the week, he should certainly be able to do so with the aid of a capable wife, or, if a bachelor living at home, he could probably arrange with some member of the family to assist him at such times. Profits during the working-up stage would not come from new-laid eggs only, because there would be the cockerels for table, and something could be done in eggs for hatching, while day-old chicks and even growing pullets might be included among the sales. However, I am firmly convinced that it is possible in a period of ten years for the average poultry-keeper to develop his flock to the stage which would support him. It must not be thought that such an achievement is a simple matter; but it has been done in several cases—and, too, in less than ten years—hence it is worth a trial.

This much is certain; if through circumstances over which he has no control he cannot extend to the full bent of his ambition and develop his hobby into a full-sized business venture, that hobby should at least prove an interesting and remunerative one. Moreover, when there is every prospect of the ideal being reached, the small poultry-keeper who has used his profits to build up a poultry farm will, from the experience he has gained, be in a much better position than the novice who has just enough capital to start a farm, upon the proceeds of which he must depend for his living. Failures have been due to the fact that the whole of the capital has been invested in the business before the necessary experience has been acquired. It is a mistake so often made; and many a man within my knowledge has thrown up a certainty and staked his savings in an attempt to make a living from poultry without having the least idea of what it involves.

FIG. 213. CHICKS ABOUT TO FLY TO SWITZERLAND

Scarcely a week passes without my getting an inquiry concerning poultry-farming from people who are entirely ignorant of the business, some of them being candid enough to admit it; but I do my best to warn them against taking such a step. A sound grounding of practical experience is essential. Building up is a very slow process, admittedly, and requires no end of patience; but in capable hands it is a sure one. And it must be slow, because attempting to advance too quickly, or endeavouring to increase the stock before being certain that the best is being made from the existing flock, will not lead to success. It is possible to keep a very considerable number of fowls and, at the same time, earn a living at some other vocation; but it is possible only when one is particularly well situated, is thoroughly experienced, and has the assistance of someone keenly interested in the building-up process, because under the very best system yet invented, fowls which are left to their own devices all day and every day do not give sufficient return to enable their owner to make a living from them.

Those who should Succeed

The man who has a pension sufficient to live on should find little difficulty in building up a good-sized flock in a few years from a very small investment, provided his inclination lies in that direction and he has the opportunity for carrying his plan through. Several such cases have come under my observation; and one of the most successful poultry-farmers with whom I am acquainted at present is an ex-service man who, owing to disablement, is drawing a small pension. Finding it inadequate to provide him with the living he required, he conceived the idea, less than ten years ago, of taking up poultry-keeping. He began while living with his brother, a farmer, and

started with a few sittings of eggs from general-purpose breeds, which he hatched and reared by hens. Of the chickens, he was successful in disposing of the cockerels for table and running the pullets on for winter laying. The result was so satisfactory that he had no difficulty in finding buyers for an increased output; and to such an extent that within six years he was renting a farm and employing a youth to assist him. To his stock of fowls he added ducks for the supply of early ducklings; then followed a pen of

FIG. 214. A CONSIGNMENT OF 100 PULLETS (AND APPLIANCES) BEING LOADED ON A LORRY FOR CONVEYANCE TO THE STEAMER FOR SHIPMENT TO VIENNA

stock turkeys, while when last I was at his farm there were some very serviceable geese on one of the meadows.

By dint of hard work and straight dealing—and the possession of that most valuable of assets, a sunny disposition—he has got together a splendid trade and has an excellent reputation for the quality of his produce, the bulk of which is sold to hotels and direct to consumers, since little of it is disposed of through retailers, while none goes to market. As he once told me, he is not making a fortune out of the farm; but it is keeping him employed, and his profits enable him, with his none too ample pension, to live comfortably. When he started, his fowls were certainly allowed to run rent free, as is almost invariably the case with garden poultry-keepers, although they had the benefit of farm land; but the only other advantage he had was in being able to rent a farm with several decidedly useful out-buildings for quite a nominal figure.

Selecting a Suitable Branch

When poultry-farming first appealed to people as a means of gaining a livelihood, the farms which were established were devoted to general poultry culture, although there was a leaning towards egg production rather than to the production of table poultry, because this latter was accepted by most authorities as the special work of rearers and fatteners in the south-eastern counties, where it has been carried on for hundreds of years. Since those days, of course, progress has been made; but while we have vastly improved our methods, to such a small extent have we advanced that the majority of poultry farms now existing in this country can still be placed in no more detailed classification than that of egg farm or table poultry farm.

There is no doubt, however, that the trend to-day is to divide poultry-farming into a number of specialized units, because both egg production and table poultry production embrace departments which might form a speciality for a separate business. It is thought by some authorities that the general poultry-farmer fails to reach the highest pitch of efficiency because he divides his attention in too many directions and, at the same time, fails to make the maximum use of all his appliances and equipment; in short, that he is Jack-of-all-trades and master of none. For this reason, therefore, there is a tendency for some to concentrate on the breeding of pedigree stock for

laying, others to make the hatching and rearing of pullets their mainstay, and, again, others to get their returns solely from market eggs, purchasing ready-to-lay pullets each season and thereby cutting out breeding, hatching, and rearing operations.

There can be no question that the establishment of breeding farms, at which the speciality is the production of sound commercial stock, would appear to be of some importance; because it is very evident in too many cases that the endeavour to breed from the record-breaking birds which are said to be essential to enable the commercial egg-farmer to get the maximum profit from his layers, is tending considerably to that loss of stamina which is so prevalent among such stock to-day. One of our most successful commercial egg-farmers—Mr. F. C. Atkins, of Newbury, Berks—has stated that the prevalence of disease and loss of stamina which have been so evident of late years are in no small measure due to persistent efforts to breed from stock which, though perhaps useful for egg production alone, is quite unfit for the breeding pens; and in his opinion, the egg-farmer cannot hope to be careful in the management of future stock birds and at the same time obtain the highest possible yield of commercial eggs from them, as the two endeavours are not compatible.

In connexion with several of the laying competitions which are held throughout the country—and now generally referred to as Laying Tests—the aim to-day is not to encourage pullets to produce the greatest number of eggs, but rather to ensure that birds which put up good records are also of sound constitution at the finish; and in connexion with at least one of them the announcement is made that its test is not a competition for number of eggs but a genuine endeavour to test the staying powers of the pullets entered.

FIG. 215. EXPORT OF CHICKENS AND STOCK TO THE CONTINENT

Not the least interesting part of the business of poultry farming, when pedigree breeding is being undertaken, is the export of chickens and stock to the Continent, and Messrs. John H. Dowden & Son participate in it to a considerable extent. A consignment of 1000 day-old chicks at Heathfield station for dispatch to Switzerland. The open box in the centre shows how the birds are packed for the journey

It is my experience that some commercial egg-farmers do turn male birds into their ordinary flocks of layers, and use the eggs for hatching and rearing the pullets they require for replacements; but such indiscriminate breeding from unselected birds can result only in deterioration, and especially when the layers are at all times expected to give the maximum production of eggs. Breeding from immature females, from pullets, is also accountable for loss of stamina; and, many years ago, I cautioned egg-farmers that the treatment of layers and breeders should be distinct.. What I then wrote was, "A great winter layer rarely makes a good spring breeder, while a heavy layer should not be used as a breeder until she is in her second season. It is too much the custom nowadays, after pullets have gone through heavy winter laying, to run them on for spring breeding. It is folly to expect birds to do all this in a satisfactory manner; and the sooner it is understood, the better for the poultry-keeper."

Breeding Fowls for Laying

If it be true that the commercial egg-farmer to-day cannot exercise proper care in the development of his breeding stock, then it is certain there is an opening for the breeding of fowls for laying. The establishment of a poultry farm which concentrates solely on the production of commercial stock of proved vigour does not strike me as being a very sound proposition for the owner of it, simply because the purely commercial egg-farmer (who disposes of his produce through the usual market channels) not only wants large quantities of pullets of a high grade of stamina, but he requires them to have really useful laying powers, and at a strictly moderate price. It is certain that such pullets could not be produced at the cost at which the vast majority of egg-farmers are prepared to pay, even if egg prices are ever stabilized. At any rate, it could not be carried out on individual

pedigree lines and would have to be simply the production of stock fit to stand heavy feeding for egg production. Such a farm would assuredly be beyond the scope of the novice, unless he had made a special study of the subject during his years of training, or he had concentrated on it during the building-up process.

Many a small poultry-keeper, nevertheless, and particularly when keenly interested in the improve-

FIG. 216. THE WHITE LEGHORN FOR COMMERCIAL EGG PRODUCTION

A fine flock of White Leghorns at a well-known Hertfordshire poultry farm. To show to what extent these birds are valued for egg production, it may be mentioned that over 2000 of them (hens and pullets) are kept on one section of this farm, part of which is depicted above

ment of his laying stock, has furnished ample proof that he can produce pullets fit to win high places at the Laying Tests; and one of the earliest winners of a gold medal at what is now the biggest test in this country—and in the world—wrote to me at the time, thanking me for the advice I had given him and regretting that he could not fill half the orders he had received, as he was only in a small way, although to-day he is among our best-known breeders of pedigree layers. This breeding of dependable laying stock, therefore, is a department of egg-farming which the novice might work up to, since the hatching of the bulk of the eggs and the rearing of the chickens could be left to another establishment.

It must be understood that this part of the business, at any rate the hatching of such eggs, could scarcely come within the purview of the modern hatchery; but it could well be undertaken by poultry-farmers who employ cabinet incubators and the battery brooder system. It would have to be carried out on such a scale to make it a commercial proposition, while the land would have to be of sufficient extent to provide a wide range for the growers, and thus ensure vigour—and economy in the rearing—of the chickens. The pullets would be the chief source of income; but it should be possible to make a selection of the cockerels for stock purposes. It would be only by some such means as these that pullets could be sold to commercial egg-farmers at the economic prices they desire.

Anyone starting poultry-farming with this object in view would have to have a considerable capital, in addition to a good knowledge of chicken rearing, because it would scarcely answer to separate the hatching from the rearing, since it is the latter, i.e., the growing of the pullets to the ready-to-lay stage, on which the rearer would have to depend for the bulk of his profit. We look on the raising of young stock as highly skilled work, as indeed it is; and when undertaken on a large scale by those who have many other duties to perform at the same time I fear it is apt to get scamped, or it does not receive the attention it requires. Nevertheless, it is not beyond the scope of a man of average intelligence who has his heart in the work and concentrates on it, provided he has come through his novitiate at chicken rearing with full marks. It is certainly one man's

job, and no light task either, when carried out on a large scale.

Pullets for Egg Production

There is, then, the third stage or unit of commercial poultry-farming, namely, the running of pullets solely for egg production, that branch of the business which deals with the production of market eggs. Many there are who specialize in it, and among them are those who have told me that were they starting to-day they would not tie up any capital in equipment for hatching or rearing, but purchase pullets on the verge of laying for replacements each year. That they cannot do so now I can well understand, because it is no easy matter to scrap existing equipment. On the other hand, I have met egg-farmers who declare that the most successful men are those who keep their own breeding stock and do all the hatching and rearing on the premises, because there is too much risk in buying eggs for hatching—an opinion with which I certainly do not agree.

It is not a difficult matter to get into touch with thoroughly reliable breeders, who will give a guarantee as to the quality of the stock they keep and its freedom from disease. If this were not so, then there could not be the large trade in eggs for hatching, in day-old chicks, and in growing stock which exists nowadays. It is simply a matter of paying adequate prices for one's requirements. However, whether in the present state of affairs—the shortage of breeding and rearing farms—it is more economical to breed and rear one's own pullets than to purchase such birds when they are almost at the laying stage, or vice versa, it is not easy to decide. Everything, of course, will depend upon the price one has to pay for the finished article, and of what that article consists.

No doubt the principal objection many people have to purchasing the ready-reared bird is the difficulty of obtaining pullets of the stamp required at an economic price. But what is that economic price? It would seem to be unreasonable to expect to purchase them, even in large quantities, for less than £35 a hundred, because no one is going to sell them simply to clear the cost of their rearing. Now at such a figure, viz. 7s. a head, the man who is making a speciality of commercial eggs has to consider what return they will bring. Good stock which is well managed can be relied upon to lay for two seasons; so presuming there is an average production of 160 eggs per annum, selling at an average of 1s. 3d. a dozen, which is by no means high, the produce of each hen for the two years would amount to £1 13s. 4d. From this sum there would have to be deducted the cost of her food and a certain percentage of the overhead charges for that period; but these would probably be covered by the shillings and pence, and so the difference between what remains and the purchase price of the bird (7s.) leaves a profit of 6s. 6d. per annum. There would be in addition, however, an item which must not be overlooked, viz. the price realized for the hen when her usefulness as a commercial layer had ended. Granted no deaths, the profit on 1000 layers would, therefore, be more than £325 per annum.

It is, nevertheless, scarcely advisable to calculate one's profits in advance and start poultry-farming on the strength of a few sums scribbled out on paper. My own experience is that the profits of commercial egg farms vary to no small degree, and over a period of thirty years I have seen them as low as 2s. 6d. a head and, in those very exceptional boom years after the war, as high as 20s. per annum; but even at the present time it varies from 5s. to 9s. on a flock of 1000 layers, while there have been those who incurred a loss on such a flock.

A Question of Profit

In the circumstances, therefore, I do not propose telling readers how much they should or can make out of a given number of fowls, because there are pullets and pullets, and not every bird from the very best laying strain follows the excellent example set by her dam. On quite a few occasions I have purchased pullets ready to lay, and with varying results, although all of them were of a high grade of stamina and with useful laying powers. Perhaps the best, within recent times, were some Light Sussex and Rhode Island Reds, range-reared birds and bought at much less than 7s. a head from breeders who were unknown to me. In each case, however, although there were one or two deaths, the net profit from them over two seasons averaged over 7s. a head, while I sold many of them as fat old hens dressed for table at prices almost equalling the amounts originally paid for them. On the other hand, a bunch of White Wyandottes obtained at a much higher figure from a breeder of some repute were about the most disappointing layers I have ever kept; and over their two seasons—I kept them specially for that length of time to ascertain their actual value—they left me a very small margin of profit, including the price for which they were sold in their old age.

I mention these instances merely to demonstrate to the novice the futility of calculating one's profits in advance; and it must not be inferred that I do so with the idea of proving that cheap pullets are more reliable profit-earners than other kinds, or that Light Sussex and Rhode Island Reds are better layers than White Wyandottes. It simply means that when purchasing stock certain risks must be run by the

man who is nothing but a specialist in the production of eggs, the poultry-farmer whose profits depend solely on the produce of birds which he buys as pullets when they are ready to be put into the laying quarters, so that, by eliminating the keeping of breeding stock and the rearing of chickens, he can devote the whole of his time to getting the very best results from the birds. Nevertheless, I am firmly convinced that the setting up of farms at which ready-to-lay pullets were specialized in would very considerably minimize such risks and result in a much more dependable type of layer, one which would stand up to two seasons of heavy production.

Here, then, are three special branches of poultry-farming, and in connexion with egg production only, upon any one of which the beginner would do well to consider the possibilities of concentrating, because progress is in the hands of newcomers to the industry rather than of the old stagers, who are apt to be set in their ways. Of these branches, that of breeding is undoubtedly the most difficult, because it calls for knowledge in the selecting, mating, and managing of stock; and yet, for the object in view, it is nothing like as complicated as breeding on individual-pedigree lines. It amounts to no more than forming strains (or families) of fowls possessing a high grade of stamina and with useful laying powers. In this case, the handling of layers must be understood, not so much for actual egg production, but for their suitability to produce strong chickens; and second-season or older hens would have to be used in preference to pullets, their pullet offspring being run on for a season for selection for future breeding pens. Such stock must be managed with a view to their value as breeders, and not on the lines of birds kept for large egg yields. A certain amount of trap-nesting would have to be employed in the pullet stage, to enable the weeding out of any really poor layers; but the chief aim would be to produce sturdy stock, so that fertility, hatchability, and rearability would be ensured. Such a farm necessitates the use of plenty of land for large runs, because on no account should it be attempted on intensive lines.

Specializing in Hatching and Rearing

To make hatching and rearing remunerative for one specializing in this section, mammoth incubators and battery brooders would probably have to be used, as it would scarcely be profitable to attempt either one or the other on small lines. Hatching would have to be done in large quantities to ensure an adequate supply of pullets, because, while I do not go so far as to state that seven eggs have to be incubated to ensure one pullet chick being hatched, I do know that, on the average over a season, one has to reckon on the sexes being about fifty-fifty. This would entail that bugbear of most hatcheries, the unwanted cockerels; hence, if pure breeds were being dealt with, the specialist undertaking the hatching would have to be an expert at the sexing of day-old chicks, to enable him to rear the pullets only. In the case of his dealing with general-purpose breeds, however, he could rear his cockerels along with the pullets until brooder heat was dispensed with, and then dispose of the former to rearers of table chickens, because he would probably not include that branch.

On the other hand, since the specialist egg-farmer would require his pullets for egg production only, and not to be kept for stock breeding, there is no reason why sex-linked birds should not be employed for this purpose. This would considerably simplify matters for the man who concentrates on the hatching and rearing section, as he could remove the cockerel chicks as soon as they had settled down in the artificial rearer after being transferred from the incubator. The use of sex linkage would in no way interfere with the poultry-farmer who specialized in breeding stock (to provide the eggs for hatching), except that it would necessitate his keeping the two breeds required for the link—for the supply of cockerels and hens for his own pens—unless he brought in fresh cockerels each year. Nevertheless, as both of the breeds he used would be pure bred—as they must be to produce the first cross known as the sex-linked one — he would find plenty of ways of disposing of their eggs. Few specialist egg-farmers have exploited sex-linked pullets for their purpose, possibly because in all crosses there is a percentage of broodiness. As long as they pin their faith to light breeds, and particularly the White Leghorn, I should certainly not advise anyone starting as a specialist breeder, in connexion with the subject we are discussing, to take up such a breed, for the very simple reason that the cockerels are too numerous and practically unsaleable, which would make the price of the ready-to-lay pullet too high for the egg-farmer.

It will be seen, of course, that these three branches depend to a great extent upon one another. It may be thought that both the breeder specialist and the one concentrating on hatching and rearing would experience considerable difficulty in finding profitable outlets for their produce until each had established a good reputation. But although this undoubtedly is so when pedigree-breeding is undertaken—and one has to be established for several years before one can command high prices for stock—it is not the case with utility birds of the kind required, if for no other reason than that the demand for ready-reared pullets greatly exceeds the supply, while egg-farmers should be sufficiently experienced with laying stock to know

from the appearance and handling of the birds whether they are suitable for his purpose.

I must admit that both the breeding and rearing of laying pullets are not the most remunerative branches of poultry-farming, because there is not an all-the-year-round demand for such birds at the present time; and while the sale of eggs by the breeder would be by cash transactions, the specialist who grows the pullets would have to wait five to six months for any return, since such a period must elapse before the birds are fit to be sold as ready-to-lay stock. Of the three branches mentioned, the management of layers undoubtedly makes the most appeal to beginners in poultry-farming, possibly because so many of them have gained their earliest experiences with a few hens in the garden; but, while this part of the business is nothing like as easy as it looks, it does show an almost immediate return, in that as soon as eggs are forthcoming they are turned into cash.

Table Fowls

However, there is another branch of poultry-farming, viz. table poultry production; and in this, also, there may be possibilities of dividing it into several sections for those who wish to specialize. The professional fatteners of table fowls in Sussex rarely, if ever, breed or rear the birds which they cram and finish for the London markets. Such fowls as they require are obtained from many parts of the country, although in earlier days they were generally supplied solely by cottagers and farmers in Kent, Surrey and Sussex. It has been suggested by one or two authorities that there is an opening in this direction—in the rearing, not the fattening—for poultry-farmers; but it is not a branch I can recommend as one in which to specialize. In my opinion it would be far more suitable for the specialist who takes up the hatching and rearing of pullets for egg production, since it would enable him to utilize his appliances and equipment for a longer period. Not only could he thereby put his surplus cockerels to good use—if the breed were suitable, or sex-linked chickens were being reared—but he might find the large hatcheries of service as a source of obtaining day-old cockerels.

These two branches of production, although each calls for somewhat different treatment—as I have shown in previous chapters—could be combined with advantage, because the best period for the rearing of stock pullets is also about the least profitable time for the raising of table birds. If this combined attempt be made it should be confined to the production of country chickens, at any rate until one is thoroughly experienced in the work; because this class of fowl, although requiring careful handling, does not need the specialized fattening and expert finish of the super-Surrey chicken. Moreover, if it is understood, the returns are reasonably quick, since the birds are off the rearer's hands in from twelve to fourteen weeks after they are hatched. There is always a market for such commodities as table chickens; but the beginner must remember that the price realized depends solely upon the quality of the article.

So much, then, for specialized branches. In the opinion of Mr. F. C. Atkins—to whom I have already referred—it seems to be inevitable that egg and poultry production will develop along lines of closer specialization; hence he advises newcomers to the business to keep this in mind when making their plans. The beginner might perhaps consider concentrating upon one particular aspect of poultry husbandry, if merely because it is not so difficult to master one closely specialized line as to become expert in every branch of production.

General Poultry Culture

At the same time, many poultry-keepers with a fair general knowledge of the subject, gained during their years of building up, are averse to specializing when they develop into poultry-farmers, studying rather general poultry culture, so that while making a special feature of one section, they do not concentrate on it to the extent of overlooking others. It has been said of them that they never become masters of any branch; but it is equally true that the specialist who puts all his eggs into one basket may be hard put to it to carry on if a slump should occur in his particular line. However, the best advice I can give to the beginner is to start in a modest way and be guided by circumstances. By all means let him concentrate on one branch to the extent of making it a special feature, should the occasion arise for doing so. In a large measure the choice will have to depend upon the demands of the district in which the farm is to be established, because, unless he has a remarkably large circle of friends and acquaintances who will not only promise to take, but will actually become buyers of, all the eggs and poultry he can produce, he will in all probability have to get the bulk of his income, at first, through local channels.

In some parts of the country it may not prove as remunerative for the producer to trade in new-laid eggs as to cater specially for table birds; in others it may be the reverse, that is, it would not pay him to go in for prime table chickens, because the surplus cockerels and even the old hens would be all which he need supply to meet the demands. It was so while I was residing in a district of Buckinghamshire some years ago, when any table bird approaching a Surrey

chicken was unsaleable. These are matters on which full inquiries should be made before the farm is started.

It is always advisable to have some idea of local demands, since often enough a very satisfactory connexion can be secured with a little trouble in one's own locality; and such trade may well prove more profitable in the long run than sending the produce to a distant market. According to that trade, too, and the extent and nature of the land, it might be beneficial to widen one's scope beyond fowls, and include ducks or other species of poultry in the farm. The poultry-farmer who does not aim too high at the beginning but goes cautiously to work and increases his stock and his trade as he gains knowledge is more likely to make a lasting success of the business than is he who begins on such a large scale that the affair soon becomes unmanageable. Limited capital is not necessarily a deterrent to progress; success depends upon the initiative of the individual and his business ability.

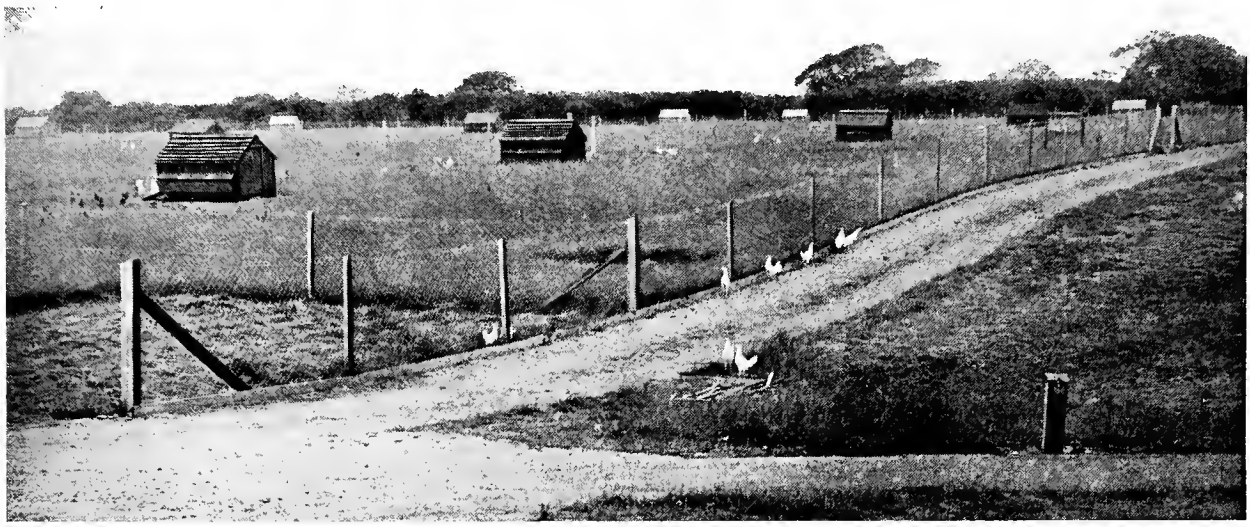


FIG. 217. FIELD HOUSES FOR LAYERS

A section of a poultry farm showing excellently arranged field houses for layers. On a poultry farm in my own district, several thousands of pullets are so kept, in small units, for commercial egg production

Which System to Adopt

During the past few years considerable progress has been made in poultry-farming as a commercial proposition, and this advance has quite naturally brought with it new systems of housing and management, while in some cases those which were condemned in the past as useless have been found to fit in with modern requirements. It is scarcely surprising, therefore, if the beginner finds it a difficult matter to make a choice, considering the numbers which are now in vogue—or if not actually in existence as profitable concerns then advocated as such by someone with ideas. However, since farms vary to no small degree as regards situation, soil, extent of land, and so forth, and, moreover, there are to-day several branches of the business in which it is possible to specialize, it must be evident to anyone who cares to give the subject a moment's thought, that no hard-and-fast rules can be made which are applicable to all.

At the outset, let me say that there is no one system, and one only, which is suitable no matter how variable may be the conditions; and by this I mean that, with very few exceptions, most of them can be carried out on extensive, intensive, or semi-intensive lines, and also in large flocks (or mass production) as well as in small units. This will be found to be so no matter if we deal with the hatching of the eggs, the rearing of the chickens, the keeping of breeding stock, the management of layers, or the production of table birds. Some authorities there are who insist that poultry farms of the future will be entirely portable, in that whether they be confined to the rearing of chickens for egg production or table use, the keeping of breeding stock, or the accommodation of layers, each will be carried out in small units and in movable houses. On the other hand, there are equally practical men who assert that fixed houses and to a great extent intensivism will be the features. But what so many advocates of one or other system appear to overlook is the farm itself, or rather the land which is available for the purpose.

In certain branches under certain conditions inten-

sivism may be ideal, as, for instance, in the early rearing of chickens in batteries; in the production of table birds through the batteries, and the carry-on and finishing cages; in the keeping of layers in single cages, or in intensive houses. The intensive rearing of chickens on wire floors for the first few weeks of their lives has certainly given excellent results in the way of keeping such troubles as coccidiosis and bacillary white diarrhoea in check; and the poultry-farmer who specializes in the rearing of stock for whose owners are financially benefiting therefrom. There are also rearers of table chickens, on a large scale, who start their birds in batteries, then give them a spell in the open air on slats and wire floors, and finish them in the coops, although the whole of the rearing is done intensively. Again, there are those who pin their faith to some form of intensivism for the specialist egg producers, while several are convinced that the laying battery will be the ideal equipment for such stock. Farms of these descriptions are

FIG. 218. LARGE-UNIT LEAN-TO HOUSES

These permanent houses for laying stock can be used for intensive purposes, although in this instance the fowls are kept semi-intensively, that is, their range is limited to spacious grass runs. Each house is about 50 ft. by 10 ft., 7 ft. high to the peak and 5 ft. at the back. The hood or "weather-board" is a continuation of the roof, and is felted. The front, in which are the outside nest boxes, consists of wood and sliding windows. This type of house is suitable for an exposed situation

laying, i.e. for the production of pullets suitable for commercial egg-farmers, would possibly adopt such a method for starting the birds. Then, too, among those who specialize in table chickens there are many who use the battery system from start to finish, even though it has been declared by some dealers in this class of bird that such chickens are so thin-skinned they cannot be cold-stored for any length of time—which is beneficial rather than detrimental for the producer, since it prevents the dealers buying in large quantities when there is a slump and holding the chickens against the season of high prices, while from the consumer's point of view, cold-stored table birds are never equal to those freshly killed.

However, quite apart from that, there are battery plants of this description which are rendering valuable service in supplying the markets with chickens, and in existence in different parts of the country, although they are perhaps beyond the scope of the beginner unless he has made an intensive study of one or other of these branches during his years of training and can command the large amount of capital required for the necessary equipment.

On the other hand, the fold system, whether for table chickens, growers, or adult stock, is being carried out successfully on a large scale, despite the daily move of each fold to a fresh patch of land. Then, too, there is the portable house system of poultry-farming, the use of Sussex night arks, the slatted or wire floor house, the field house, and similar buildings for young or old birds; and although they do not suit all situations—and some authorities go so far as to question if they will ever be popular with egg-farmers—the fact remains that more than one

specialist in fowls for egg production is finding one or other form ideal for his purpose. This I know from what exists within a twenty-mile radius of my present residence, because all of the most up-to-date, as well as some of the oldest, styles of poultry-farming are in vogue. Thus, at one of these farms, single cage batteries for layers (a veritable egg factory) and fold pens for the growers are favoured; at a second, whose owner specializes in supplying eggs direct to a dairy company, there are hundreds of small unit field houses on a comparatively small acreage, and fenced off; at another, the laying stock, in thousands, are at range on a thirty-acre field, but free to roost (and lay) in any of the several large wire-floored houses which stand in rows and are generally open day and night; at a fourth, Sussex night arks are the only houses for the birds.

At another farm, the sole accommodation for the pullets and hens is provided in large modern laying houses, fixed, and each with its own permanent run. Then there is one, a purely intensive plant on a very big scale, with houses of a type in which the chickens, bought as day-olds, are brooded, reared throughout in strict confinement, and kept during the whole of their laying career, as the houses are readily converted for such stock. Lastly, there is a truly mixed farm, where there are fixed as well as portable fowl houses, and out-buildings also which have been fitted out for the birds, and where the whole species of domestic poultry, together with guinea fowl, are reared and kept. All of these farms are being run successfully; at least I presume they are paying concerns, because they are well established.

A Problem to Solve

In such circumstances the beginner may well be at a loss to decide which system he should adopt as the most likely one to enable him to make a living. It is certainly no easy matter, because if his inclination is for egg production, which has been the most attractive branch of poultry-farming during more recent years, he has the choice of so many; and similarly should he fancy taking up table bird production. Of course, if he acts on my suggestion and takes a thorough course of practical training before attempting to run a poultry farm, he will probably have formed some very definite ideas as to the lines on which he should proceed, and will be guided in the matter by the amount of capital he can invest; but, in any case, let me caution him to consider very carefully the land on which he intends to establish his farm.

I have kept poultry in more than one county, within one hundred miles of London; but not once have I found it advisable to adopt entirely the system previously used, while in some cases it has been necessary to make considerable changes to get the best results. For instance, at present the nature of the land is such that, in one part, it is essential to allocate two runs to each pen of layers, and to adopt intensive houses with units not exceeding fifty birds. Sussex night arks and folds on that section proved inadequate for pullets for egg production, although ideal for growers; and yet in the orchard and the more sheltered part, the ark is all that the layers require. Moreover, whereas in other localities I have housed the birds on mother earth, solid wooden floors are now required for the layers' houses to ensure dryness, and freedom from rats; and there has to be an evening round to secure the birds, even the geese, because foxes have been known to include the farm in their rambles. These may be trifling matters, but they are worth considering when having a farm in view.

Perhaps one of the difficulties of the beginner will be to secure suitable accommodation; but, having decided on a locality, he may be able to get some assistance in this matter by applying to the poultry instructor for the county. Whether the giving of advice on such a point is considered part of that official's duty or not I cannot say; but I have found many of them anxious to do all in their power to interest people in poultry-keeping. However, the beginner could otherwise consult a poultry specialist; in any case it is most advisable for him to get an expert opinion about the suitability of the land, because my experience is that there are very few land agents who, even though making a feature of poultry farms, know anything about the requirements of poultry, so many of them giving one the impression that they do not consider poultry-farming as husbandry and that land for the purpose is as valuable as a site ripe for building—it was so thirty or forty years ago, and is, unfortunately, so to-day. Having secured the site, however, there will be the lay-out of the farm, which, obviously, must depend upon the extent of the land, its situation, the special branch, if any, which is to be taken up, and the amount of capital there is to invest.

Starting an Egg Farm

Like almost every other business, a poultry farm absorbs a good deal of capital. I have already mentioned that when asked, as I frequently am, how much it requires to start a decent-sized farm as a concern from which to make a living, I almost invariably reply £1000. Plant runs away with a considerable amount, unless one is fortunate enough to have suitable out-buildings; but even then, the necessary incubators and rearers, quarters for the growing stock, as well as the layers' houses, together with wire

netting, posts, food and water vessels, and sundry appliances to equip the place, will all have to be bought. Failing out-buildings, however, an incubator will be useless without a proper place in which to operate it; the artificial rearers will likewise have to be set in some sort of shed; food cannot be stored out of doors, while the place in which it is kept will have to be solidly built and sectioned into bins of good capacity, since corn and meal can scarcely be bought by the stone when one is farming poultry.

in attending to the birds. It might even be possible to devote it to the small unit portable house system, which is becoming so popular, although I should certainly not recommend a novice to attempt it, if merely because such houses must be periodically moved.

If, therefore, the former method is chosen, two seasons should be allowed as the time in which to equip and stock it with 1000 layers, raising half the number each season, so that when it is completed

FIG. 219. A SECTION OF A WELL-PLANNED POULTRY FARM

The large houses, of the hump or hip-roof type, have drop-in top windows, and floor lights which open upwards. The house in the foreground, fitted with outside nest boxes, is low enough to encourage some fowls, White Leghorn cockerels, to roost on the ridge. As will be seen, the roof of this structure is made of weather-boards, and is not covered with felt

As to the amount of land, it may be said that, if the usual lines of semi-intensive commercial egg-farming are followed, a minimum of five acres will be required to accommodate 1000 fowls and to provide for the annual rearing of young stock for replacing the hens which have come to the end of their second laying season. However, it is advisable to have more than that amount of land, because there should be some in reserve to allow of further development.

A 1000-bird farm may appear to be a very large affair to many novices; but a commercial plant with that head of stock is really of very medium size these days. Moreover, it is not too large to be managed by a capable man, if the place be properly laid out, while, with the assistance of a youth, he should rear the necessary quantity of pullets each season for replacement. Admittedly, it would mean constant work; but I have yet to hear of a successful poultry farm which has not entailed hard work in the establishing of it. A five-acre farm is by no means a big one, even for commercial egg production on semi-intensive lines, while the use of modern laying houses and up-to-date methods of feeding very considerably reduce the labour

there are 500 pullets and a similar number of yearling hens. From then onwards the older birds should be discarded each year and replaced by a similar flock of pullets, so that a fairly level production of eggs would be ensured year after year. The first season's complement of pullets could be obtained by purchasing breeding pens and hatching and rearing from those birds, or by buying eggs for hatching, or day-old chicks. Which way should be chosen will depend to a certain extent on the time of year in which the start is made, because the cost will not differ much in the long run.

When to Commence

If the beginner has had experience of incubation, then I suggest he should commence early in winter, at any rate some time in November, and with breeding stock; since, allowing for the birds settling down, and for the collection and incubation of the eggs, he should have his first batch of chickens in January, and can continue hatching until April. This will mean that he should have chickens of various ages; but it will be an advantage rather than otherwise, because,

granted all has gone well, the earliest of the pullets should commence laying in late summer, and others begin in succession. The fullest possible use should be made of the breeding stock during the first year, and, indeed, in subsequent years, if the birds have given satisfactory results, as it is possible to breed from hens in their third and fourth seasons.

Should a start with the farm be delayed until the turn of the year, then hatching eggs could be bought from which to obtain the pullets; and since 500 birds will be required some 1500 eggs will have to be incubated. There are authorities who estimate that it takes an average of seven eggs to every pullet reared to maturity; but even allowing for the usual fifty-fifty of each sex, and for dead-in-shell during incubation, as well as rearing losses, three to one should be sufficient to ensure the requisite number of pullets from eggs produced by sound stock.

The third way in which a beginning could be made is by purchasing day-old chicks; but unless one stipulates for guaranteed pullets—which adds considerably to the cost—at least half of the birds are likely to be cockerels. There may be even a larger percentage of males in what are known as mixed day-old chicks. In all these instances, as can be seen, there will have to be rearing equipment, and incubation, as well, in the case of breeding stock and hatching eggs.

It is this part of the business which the up-to-date commercial egg-farmer is desirous of eliminating, hence his anxiety to be able to purchase partly-reared or ready-to-lay pullets at economic prices. This, however, is probably the most expensive way of starting at present, although in the latter case the birds should be giving some return within a few weeks, if they are bought in late summer. However, despite the fact that there is much outgoing in the rearing of chickens, there should be an income from the cockerels if they are suitable for table purposes. In this case, the earliest hatched birds should yield the best returns; but there is a possibility that even those of late hatches may meet with a profitable market in the locality. For the beginner, therefore, there are four possible courses; and the choice will depend upon the circumstances affecting each individual case.

Apportioning the Capital

I have mentioned £1000 as the sum to invest to establish an egg farm carrying sufficient stock to provide its owner with a living in a short time, granted he has had practical training. Until one gains knowledge of poultry-farming as a business—and it can be a success only when run on strictly business-like lines—it would be most unwise to commence on a larger scale. The novice will want to know how to apportion his capital to the best advantage; but in this matter it is hardly possible for me to go minutely into figures.

He can reckon on the expenditure for the first season accounting for about £600, as such a sum will be required for buildings, appliances, stock, food, rent, and sundries, while in the second season, the outgoings not being so heavy and a substantial revenue being obtained from the sale of eggs, another £150 should be allowed for out of capital account. This would mean that, by the end of the second season, when the farm would be equipped and fully stocked, £750 had been actually laid out on the business, while of the original capital (£1000) there would be a sum of £250 to provide for living expenses over a period of not far short of two years. As a matter of fact, however, a larger amount could be available, because a certain income should be derived from the sale of the cockerels, particularly if the breed selected were of a general-purpose and not a light kind. A very considerable saving could also be effected by building one's own brooder houses, store room, incubator shed, and so forth, while much less would be required if permanent buildings were already on the farm, in which case a laying house or houses for 500 pullets would be the only extra required for accommodation during the first season.

When seeking a site for a poultry farm the value of good out-buildings should never be overlooked, although they might possibly entail the payment of a slightly increased rent. Rent, of course, is one of the chief points to consider; and anything above £50 per annum for such a farm would scarcely be profitable, except in rare cases. Once the farm is fairly established, however, a profit of 25 per cent on the capital invested might reasonably be expected. It is quite possible to do even better than that, because, as time goes on, opportunities occur of adding to the profits; but I must warn the novice that, on the other hand, it is quite possible to make an utter failure of the whole undertaking, especially if he imagines that all he has to do is to procure a suitable house and land, stock and appliances, and sit around waiting for orders to arrive or for someone else to do the work. Egg-farming is what may be termed a tight business, as every item has to be watched; but a nice percentage on capital investment can be made by capable men.

Table Poultry Production

Egg production, of course, is not the only branch of poultry-farming in which one can specialize, because there is the production of table birds, which has proved profitable during recent years. Neverthe-

less, while it may not require the investment of as much capital, the percentage of profit, on the average, is no higher, although the bulk of the capital is being turned over twice or thrice a year. It has to be undertaken on a very large scale to enable one to make a comfortable living from it as a special business, distinct altogether from any other branch of poultry-farming. Moreover, to succeed at it one requires to have a sound knowledge of the technicalities of the work, which are more intricate than those of egg production; and it is certainly not an easy way to make a fortune. The specialist in table poultry production must cater for the best markets to secure the highest return for his birds; and, since his chickens must arrive at the killing stage in the shortest possible time, he must be an expert at battery brooding, because only by adopting such modern methods can he hope to secure what he desires. There are some specialists in this line who rear the birds right through in carry-on cages before they are put into the fattening pens, while others give the chickens a spell in the sun and fresh air at a certain stage, but generally off the ground.

Ground rearing for such birds is not now tolerated on the most up-to-date plants used for table chicken production, since scratching exercise is not required, quicker growth being obtained without it. The aim is to get an average weight of at least 3 lb. each in twelve weeks, just before the final stage commences. The rearing must be wholly intensive, and on slats or wire-netting, since the birds which are placed out of doors are kept in slatted floor brooder houses with verandahs off the ground. Their whole growth is forced; and to do this without causing leg weakness and other troubles requires vast experience. The brooding is done in comparatively small units—which, let me add, is the ideal method of rearing chickens for stock or laying.

With such modern plant it is possible to produce table chickens at all times of the year; but there are seasons when to do so will not be profitable. Even incubating for the best market, which means making a start in September and closing down hatching in April, does not keep the plant fully occupied. There are specialists who make a good profit from it, admittedly, but even with the most modern of appliances, success comes only to those who thoroughly understand the work, from the time the bird enters the brooders until the highly-finished product is marketed. The quality must be high, while production must be on such a scale that the chickens can be standardized and graded.

It is work which requires a high degree of skill in growing, fattening, and finishing, since the vast majority of the birds are crammed; hence it is not such as is likely to appeal to the novice. At any rate, he would be ill advised to attempt making a speciality of it in his early days. What he might well try, nevertheless, would be to aim for a high standard of quality in his surplus cockerels for the country chicken trade, and thus combine table bird production with the production of layers. He would then be keeping his hatching and rearing appliances more fully occupied than he otherwise would do, as he could commence incubation in late autumn or early winter. There would be no necessity for him to go to the expense of installing all the plant connected with table bird production such as I have just mentioned; and provided he had the accommodation for winter rearing, in the form of brooder houses, he could ground-rear the birds in the usual way and grow them on the fold system, before trough-feeding them as described in the preceding chapter. Let him at all times aim for a good quality bird, well turned out, because the market is glutted with third-rate table fowls which, obviously, fetch only low prices. There is a good demand for the best, and the producer will be wise to cater for it.

Planning a Small Farm

So far I have dealt with two branches in which the beginner might well attempt to specialize when taking up poultry-farming; or perhaps it would be better for him to combine the two, with egg production as his chief means of income. In addition to them there is pedigree breeding, which, however, is a comparatively slow process, because one has to make a name before it can be developed into a profitable business or even a paying branch of the farm; and, moreover, it entails considerable outlay in the building up. There is, too, the production of pullets for the commercial egg-farmer, who would be able to concentrate solely on this special line if it were possible for him to eliminate the breeding and rearing of the stock he requires. There are possibilities in this branch as a speciality, provided ample range be available on which to develop the pullets to the ready-to-lay stage at a reasonably low cost for food; and the inability of many poultry-farmers to secure such accommodation at a nominal rental is the greatest deterrent to it. That the demand for such stock is a good one, and likely to increase, I have not the least doubt. It would have to be carried out on a large scale to make it worth undertaking; but it would not be essential to set up numerous single-mated pens, because flock mating would answer, the object being to specialize in one variety only.

In this direction much could be done by those whose land is not devoted solely to poultry, since in such circumstances the range would be free, not only in

extent but as regards rent. It would certainly be a much sounder proposition for a general farmer to rear such birds than to keep a flock of nondescript and indifferent layers, as is so often the case; and with a proper understanding of poultry he could make the maximum of profit from them.

However, all of these special lines, as well as a combination of egg and table bird production, call for the investment of a fair amount of capital, which is not within the reach of every poultry-keeper who aspires to become a poultry-farmer. There are, as I have said, a good many large poultry farms in existence which were commenced with a very small capital and developed out of the profits. This is within the reach of those who can afford to draw little or nothing out of the business for living expenses for several years; and it has much to recommend it. A good way in which to start is one I first suggested more than twenty-five years back, and which has been the means of enabling many poultry-keepers to enlarge their scope. It consists of small units on the semi-intensive system, and enables the keeping of 400 fowls to the acre. No more than that amount of land need be rented to ensure its success. The acre should be planned for sixteen equal-sized runs so that, when fully stocked with layers, there would be twenty-five birds in each section. Such an arrangement would necessitate an expenditure for fences and gates, while the total cost of the houses would probably be more than a modern laying house for 400 fowls; but the pens would be erected, after a start had been made with four, as the profits were realized.

One advantage of these small units for layers is that production would be at the maximum, granted proper management, of course, since as regards both numbers of eggs and length of the laying period it excels the large flock system. There need be no fear of the land becoming foul if proper care be taken of it, and the birds are always fed in their houses; and they would be kept intensively throughout most of the winter. Runs of such a size will be found decidedly handy for the keeping of breeding stock as well as the rearing of chickens; and although the number of fowls on such a small space on the semi-intensive system would not be sufficient to enable a man to gain a living, it should give him the opportunity of studying egg production, chicken rearing, and even table bird production, and thus gain practical experience which he could put to good use.

FIG. 220. MARKETING HOME-PRODUCED EGGS
Eggs graded according to the suggestions of the Ministry of Agriculture

Marketing the Eggs

A subject with which I have not dealt, but one that concerns those who make egg production a special feature of the poultry farm—and egg production is undoubtedly the most popular branch of utility poultry-farming—is the marketing of the eggs. This is a matter which does not cause much, if any, anxiety to the small poultry-keeper, because he probably disposes of the whole of his output direct to consumers. Such a trade as this is scarcely within the scope of the commercial egg-farmer—operating as he does on a large scale—to such an extent, at any rate, as to make it a considerable item. Consequently unless he can secure contracts with dairy companies, hotels, clubs, or institutions of one sort or another, the bulk of his eggs, if not the entire output of his farm, will have to be marketed wholesale, through the usual channels, or disposed of through a packing station.

In some cases, admittedly, local tradesmen will handle the produce, especially if it be graded for them; but it is to eliminate this part of the work that some producers prefer to send their supplies to packing stations. Probably few egg-farmers trade with higglers nowadays; and yet when one's premises are

located off the beaten track, and particularly when the poultry farm is in its early days, it is often beneficial to keep in touch with this class of buyer. I have had several transactions with them; and although some of them no doubt do attempt to take undue advantage of producers in remote districts, in the prices which they offer for their supplies, the majority of those with whom I came into contact have been as honest as any other class of dealer—they have paid spot cash and relieved me of the trouble of packing and conveying the eggs to distant markets.

Where packing stations exist within easy distance of the farm, or collectors from them visit the district regularly, then the producer should find them of valuable assistance to him in the marketing of his eggs. There are establishments of this kind in different parts of the country, and they are registered at the Ministry of Agriculture and Fisheries, a full list of them being obtainable free of charge, on application to the Markets Division. At the packing stations the eggs are tested for internal quality, a process known as candling. Those which pass the test are graded for weight, and producers are paid for their supplies at their graded value. As a rule, the arrangements work out to the satisfaction of all concerned. Occasionally producers have expressed dissatisfaction at the returns, not so much as regards the prices realized but on account of a supposed discrepancy in the grades and the percentage of defective or inedible eggs. Both of these points, however, can be checked up at home, and particularly the grading according to weights. Nevertheless, candling has been practised so widely since the introduction of the National Mark Egg Scheme early in 1929, that it is now a highly specialized operation; and by its use many defects have been discovered in eggs which formerly were sold as strictly new-laid. However, I have always found it beneficial to address any complaints to headquarters, because officials in the Markets Division are generally only too willing to assist producers and to advise them on matters connected with marketing.

Points to Observe

There are a few general hints which will be of service to producers of eggs. It is essential to collect the eggs daily, or even twice daily if the weather be frosty or muggy. On our farm the egg round is made thrice daily in the laying season, the opportunity being taken each time to pass an eye over the stock—no difficult matter here, because the laying flocks rarely exceed fifty to the house. Cleanliness must be observed in their collection so as to ensure the shells having that new-laid appearance; it would be folly to collect them in the midst of a turn at creosoting, or attending to the brooder lamps, but it would be just as foolish to imagine that white kid gloves are necessary to preserve the natural bloom of the shell. They should be put into clean baskets, and not into buckets from which wet mash has just been removed. If any of them are dirty—which sometimes happens in wet weather when the birds roam outside and cannot clean their feet on the house litter—they must be cleaned; but, whenever possible, avoid wetting the shell, because it may open the pores and, by the absorption of moisture, result in "spots" or "rots," which are very easily detected by candling. They are best stored in a cool place, at a temperature of about 50° F., and a well ventilated room, such as a larder or a dairy, is ideal. They must be in pure air, well away from any substance with a pungent odour—onions, fish, and so forth.

Any eggs which are double-yolked, misshapen, thin-shelled, cracked, or otherwise defective in their appearance, should be kept at home; and, whenever it can be avoided, fertile eggs from the breeding pens should not be sent to salesmen or packing stations, because if the weather be at all warm they may be partially incubated, while such eggs also deteriorate sooner than infertiles. Those from stolen nests or found in the litter—some pullets have an annoying habit of laying on the floor, and such eggs, if not eaten by other birds, are almost invariably buried by the workers—should be set aside for use at home. On the other hand, clear eggs from an incubator, eggs which have been tested out on the seventh day of incubation as definitely sterile, are quite edible, and may be marketed; but the expert candler will detect them and class them as "seconds," just as anyone used to handling eggs will know them by their shells having a dull appearance.

Not only must eggs be clean and sound to meet with a ready sale, but they should be graded according to weight. This is certainly not so essential if they are being sent to a packing station—although it does no harm to check them up occasionally when bringing them in from the pens—but I find it decidedly beneficial when dealing direct with consumers, while in this line, also, I sometimes grade them for colour, because, even to-day, there are people who fancy that dark brown-shelled eggs are of superior quality to white ones—and are prepared to pay extra for such a selection. The market standard for home-produced hen eggs in England and Wales under the revised Agricultural Produce (Grading and Marking Eggs) Regulations dated 10th March, 1930, allows for four grade weights; and the statutory grade designations and definitions for such National Mark produce are as follows: Hen eggs, special, minimum weight 2¼ oz., standard 2 oz., medium 1¾ oz., and pullet 1½ oz.; first quality, i.e. the eggs must not have been pre-

served by any process, the shell must be clean and sound, the yolk translucent or faintly but not clearly visible, the white translucent and firm, and the air space must not exceed $\frac{1}{4}$ in. in depth.

"Full" and "Weak" Eggs

Among market salesmen eggs are described as full in spring and weak in autumn, while farm eggs are considered by them to be more full than those which are obtained from specialist poultry-farmers, because the birds producing the former are generally kept at free range where they get abundance of natural food, and they do not lay as many eggs. In a measure this is true, but only in so far as it applies to properly-managed farm fowls compared with badly-managed and wrongly-fed birds kept under unhealthy conditions. As the poultry specialist knows, however, the internal quality of the egg is governed by the food which the hen gets; and correct management by the specialist who concentrates on egg production ensures first-quality eggs, those in which the yolk and white, at the time of laying, completely fill the shell. In the most perfect egg the contents contract during the subsequent cooling process, thus leaving a small cavity or air space; hence the necessity for marketing the eggs at the earliest possible time after they are laid. Most packing stations collect their supplies regularly once a week, while many of them do so twice weekly.

Time tells on an egg; in other words, the longer it is kept the more it deteriorates, although for home use it is quite possible to store eggs for a month in a perfectly fresh condition, by the simple expedient of keeping them on their broad domes. Such eggs, nevertheless, would not pass the candling test as first quality; so it is certainly not advisable for the producer to hold them for such a period. The question of quality depends upon the albumen or white; as age advances it becomes thin and watery and thus the yolk is apt to sink through it and adhere to the shell, or float loosely about and present a cloudy appearance when candled. It is difficult to judge the internal quality of an egg by merely glancing at its shell, although some experts declare they can do so solely by handling it; but by examining it before a strong light, holding it so that its short axis corresponds with the line of vision, and twirling it quickly —concentrating one's attention on it during the movement—a very good idea of its contents can be ascertained.

A weak egg is one in which the yolk is not central but approaching the shell, while the white has a cloudy appearance. The only way in which strictly new-laid eggs can be distinguished from stale ones by merely handling them—and it must be done gently—is that the latter invariably rattle; and this movement can be distinctly ascertained by placing the stale egg against one's ear during the movement of it. There are other signs of faulty eggs; and those readers who are interested in the expert candling of them should get a copy of the Marketing Leaflet 28, "The Testing of Eggs for Quality," which can be obtained free of charge on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

Disposing of Hens

There is just one more item in connexion with the poultry-farmer who makes a speciality of egg production; and that is, the marketing of the hens which have laid all the eggs they are likely to produce at a profit. As a rule, these birds are disposed of as autumn approaches and before they go into a moult, because laying quarters have to be arranged for the pullets which are to replace them. It is customary to send them to market for what they will fetch; and since there is generally, at that season, a considerable glut of such birds, it can be imagined that what prices they do realize scarcely pay for the cost of carriage. A glance at the table of wholesale prices in the preceding chapter gives one an idea of the figures at which they are sold in the London markets; and in country markets they are obtainable at a much lower rate. In the case of light breeds, such hens are almost unsaleable; but when general-purpose birds are being dealt with, there is a chance of getting some slight return. There has always been a ready market for fat old hens at certain seasons in connexion with the Jewish festivals, and also for shipping, but seldom is this so at the usual discard period.

Of recent years, however, some discerning dealers have found it worth their while to purchase large quantities of these birds, and, after carefully overhauling them, to make a selection of the best for sale as breeding stock. Quite a considerable trade has been developed in this direction through judicious advertising; and, in the main, it suits poultry-keepers who have not the means to purchase pedigree stock or pullets of reliable laying strains. The fact that the hens are at the end of their second season—at which they are of an excellent age for breeding purposes—and have been discarded by commercial egg-farmers, is in their favour, and sufficient guarantee that they cannot be absolute wasters, because such experts would have culled out their unprofitable birds, if any, long before autumn.

One would think that if it pays a dealer to handle such stock, as it undoubtedly does, then it should prove more remunerative to the poultry-farmer. The greatest objection which most of these specialists have

to such sales is that the time taken to dispose of the birds in small numbers would prevent their making the necessary arrangements for the pullets which must be installed for replacements. It is, nevertheless, a phase of marketing which should increase the profits of those who rear pullets for their own laying pens, because the best of the discarded hens—and the specialist should know how to make the selection—could be accommodated on the rearing ground as the young birds are transferred to the laying quarters. They could be cleared within a few weeks, and certainly in sufficient time to allow the chicken section to lie fallow and freshen up.

There are many directions in which an established poultry-farmer can extend, and as time goes on opportunities occur of adding to the profits. There is certainly a very comfortable living to be made from the business by the right man; but he must be right all through—right in his knowledge and in his dealings.

CHAPTER XII

BREEDING FOWLS FOR EGG PRODUCTION

WHEN dealing, in the preceding chapter, with the possibilities of poultry-farming, mention is made of the trend of the present day to divide it into a number of specialized branches rather than to generalize in poultry culture, as has been the almost invariable custom ever since the days when poultry raising was recognized as a definite and independent branch of agriculture.

During modern times, as we know, much progress has been made in the management of such stock, while there have been considerable improvements in the utility points of the domestic fowl, and particularly in the innate qualities upon which high egg production depends. This latter is reflected in the egg yield from commercial flocks, which has been quite substantially raised. Nevertheless, it is felt, and not without good reason, that the time has arrived when it will be to the advantage of those engaged in the egg productive side of the industry for each department of it to form a speciality for a separate business. There is not the least doubt that when one is concentrating on egg-farming to obtain the highest possible yield from the birds, it would be of valuable assistance if the breeding and rearing of the pullets which are required could be undertaken by someone else.

As one of the most successful egg-farmers of to-day has said, such men as he cannot hope to be careful in the management of future stock birds and at the same time obtain the maximum production from their layers. That, indeed, has been only too evident of late; and the indiscriminate mating of unselected birds is resulting in deterioration. Hence, the breeding of productive and reproductive stock could well be made a speciality; and in my opinion this branch presents more scope for expansion than any other phase of poultry-farming. It would have to be undertaken on broad lines; and while it could scarcely be a profit-earning business from the start, there can be no question of its ultimate financial success, proof of which is found in the operations of pedigree-breeders whose laying strains are world famous.

Despite the assertion of a well-known authority that layers had reached the level of highest development when they were at the 200 mark—and breeders of such birds were then warned that activity of the ovaries was in excess of the glands in the oviduct—that mark has been passed; hence, it would appear to be feasible that breeding for productive purposes can be developed to even a greater extent still. There are, indeed, those who suggest that the 300-eggs-a-year hen is not only a practical reality but a commercial proposition in the not-too-far-distant future. Admittedly, we hear occasionally of such a bird, although she is generally condemned as a freak; and yet, in the light of what has already been accomplished by the specialist breeder since the days when "the secret of producing good layers is to associate the pullet which proves the most precocious in laying her first egg with the cockerel which crows earliest," it is not unreasonable to suggest that much is still within the range of the specialist, and that the chapter of improvement is certainly not closed.

However, when one is breeding for egg production, the object should not be so much the attaining of high individual records as the levelling up of average egg yield by the elimination of the unfit, so that there shall be established strains of layers in which vigour and transmitting power are regarded as the fundamental factors, because the need to-day is the production of pullets which will stand the strain of heavy laying. It is quite possible that a 300-egg hen, a bird which produced that number of eggs in her first full season of laying, might be considered unsuitable for use in the stock pen. Nevertheless, I cannot imagine that anyone who thoroughly understands the breeding of layers along common-sense lines would attempt to utilize such a highly productive pullet for the purpose until she had been given a period of complete rest after she had re-furnished from her moult, and had proved at the end of that time she still maintained the splendid stamina she must have possessed to achieve such a record.

Breeding for "Livability"

Health and stamina are the chief factors in the foundation of successful breeding, and no poultry-keeper knows this better than the expert breeder. I am reminded of a slogan I once saw: "It is easier to breed for eggs than for stamina. Try the harder task; breed birds which will live as well as lay." There is much truth in it, although the vast majority of poultry-keepers would probably think it harder to breed for eggs than stamina; but birds which will live as well as lay are those for which they should strive. What far too many breeders of laying fowls do not realize or intentionally ignore is that there is a vast difference between foundation stock and commercial stock; they do not manage and feed their breeding

birds independently from their layers. But only when they do so, and regard health and stamina as of much greater importance than number of eggs, will they appreciate how valuable is such an acquisition. That is the first point a beginner must study when taking up breeding, because selection of the parents for hardiness and constitution is absolutely essential to ensure high egg production in the pullet progeny and fertility in the cockerels.

One can understand that the breeding of laying stock for "livability" may not perhaps appeal to those who are in the business for quick returns, because they have their living to make as they go along. The prospect of devoting some years to the attainment of such an ideal finds no place in their calculations; and perhaps it is because of this that many specialist egg-farmers nowadays would much prefer to concentrate solely on getting the best possible production from their stock from the ready-to-lay stage, than to devote time to the breeding and rearing of the birds.

Establishing a laying strain means eliminating the lower-grade elements from it and at the same time maintaining the others at the desired level. It is a long and tedious task, because it is largely associated with physical character—a hen's egg yield depends not so much upon the potential productive character she may inherit, as upon her actual physical character. Where all conditions are equally favourable and the birds have similar rations and treatment, it would be fairly safe to say that the very low-producing hen had not inherited the power either to produce or to transmit; and it is obvious, therefore, that the breeder would not use his lowest-grade hens as stock.

Systematized Breeding

Whether the heavy producer would be equally good as a transmitter could be proved only by testing her progeny through several generations; but such a test is worth all the time and trouble of trap-nesting, recording, and booking of details, which specialist breeding necessitates, since only by their means can there be established a strain in which productiveness as well as transmitting power are well-defined characters. To be successful as a breeder of laying stock one requires not only the power of concentration but perseverance and infinite patience—qualities which appear to be sufficiently rare to deter many from attempting it. But it is the only means of attaining permanent success; and those who are content to plod along with independent testing under exacting conditions are bound to advance in the right direction.

No one who knows anything about laying stock can deny the supreme value of systematized breeding; and detailed though such work undoubtedly is, it repays itself many times over almost at each stage, because not only does it raise the general average of the stock, but it enables one to breed solely from the birds which have been proved healthy, vigorous, and productive at different periods of their lives. Consequently it ensures the strain always being improved, with diminished mortality and a continually smaller proportion of retrograde birds. It has been said that there is a chance for every poultry-keeper to succeed as a specialist breeder, because one does not need to be born a genius or even to undergo an intensive course of training to master the detailed work it entails, while the comparative beginner is not forced to start on the bottom rung of the ladder, since, if he has sufficient courage to invest capital in the best stocks, he can commence virtually on the level attained by the specialist. Such a statement, nevertheless, wants qualifying, because it would be the height of folly to invest capital in the best stocks unless the investor had considerable knowledge of the practical side of breeding and, moreover, had an eye for live-stock.

The best strain of layers obtainable could very easily be ruined in the hands of a beginner lacking practical experience, no matter how well versed he might be in the theory of breeding; and I should not advise anyone to start on such a high plane without having previously undertaken an intensive course of training. The commencement is not the only thing which matters; to maintain a strain of fowls at a high level of production and stamina is of far greater importance. And, in my opinion, ignorance on the part of the breeder rather than carelessness of the feeder has had much to do with the somewhat high rate of mortality which has been observable of late among pullets competing at Laying Tests and, indeed, among home flocks. It is perhaps incorrect to imagine that increased mortality in laying stock is of necessity the natural sequence of high production, but it is certainly the result of failing to pay due attention to that very important point, physical character. And it is for this reason that poultry-keepers are advised to "breed birds which will live as well as lay."

The Value of Trap-nesting

In Chapter IV, on "Selecting and Mating Stock Fowls," I have given full particulars of the points for which to look when choosing cockerels to head the breeding pens for the production of layers, and I have also dealt with the handling of hens for capacity and capabilities as far as they concern stock birds. Handling is unquestionably of very considerable assistance to those who are thoroughly conversant with the bodily structure of the laying hen; and progressive laying involves a close study of the sub-

ject. The practical expert knows that by selecting the layers on a definite physiological basis he is enabled at least to exclude drones from the flock; he is fully aware that the body should be such as will accommodate all the internal organs comfortably, that digestibility by the proper absorption of food must be taken into consideration for the making of eggs, and that the texture of the skin, the length of the legs, and the appearance of the head, for instance, are all from proved layers. The selection of stock for breeding purposes is, of course, the foundation of the whole business; but in addition to the various points I have already detailed in Chapter IV, there must be available full particulars of the trap-nests and the record sheets in connexion with the male line. The males must be equally recorded with the females although, as can be imagined, not by trap-nesting them, but by their progeny.

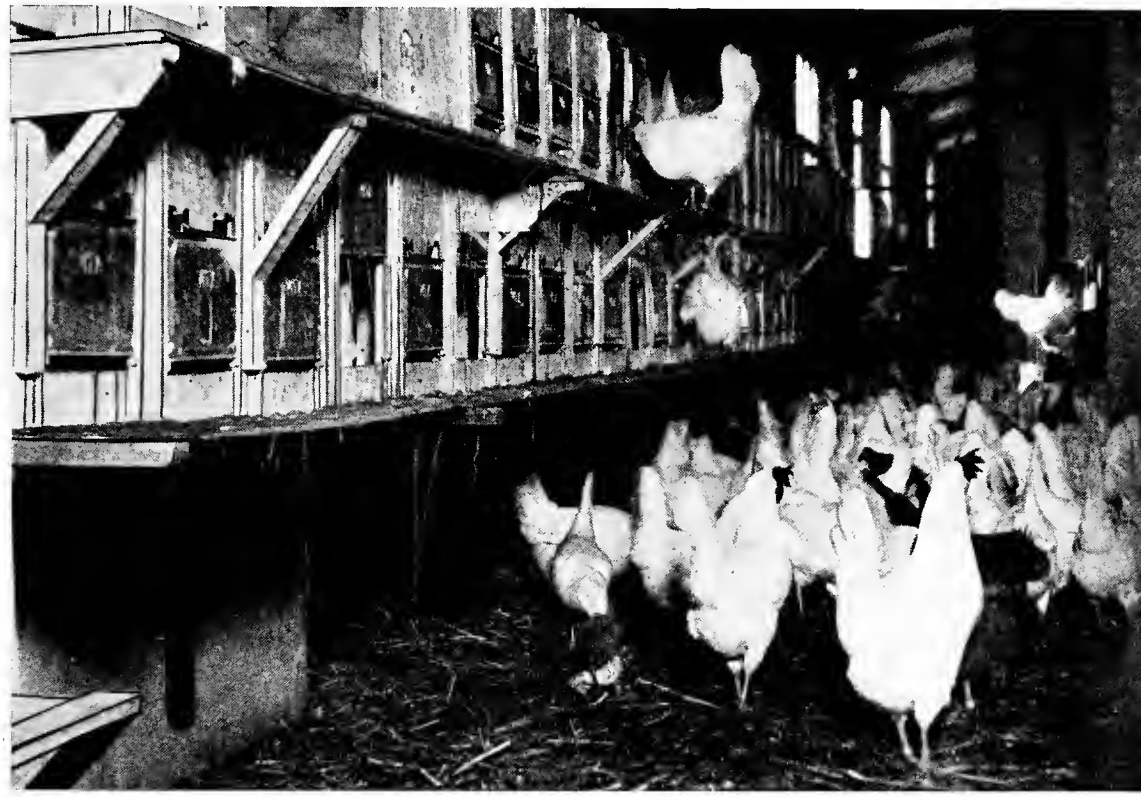


FIG. 221. TRAP-NESTING

A section of a large laying house fitted with two tiers of trap-nests

important points in the matter of egg production. But, however well versed he may be in the system of handling the birds, it is not the final word in determining which hens are the best to choose for the breeding pens; and reliance must be placed on the trap-nest.

The breeder who has to guarantee his strain of birds as being up to a specified standard of production and stamina must carry out in detail the elaborate system of trapping and recording his layers. This is essential not only to ensure which hens are the most valuable for production and vigour, but the most suitable hens from which to breed his line of male birds, because his breeding stocks must consist of sires and dams

There cannot be the least doubt, therefore, that trap-nesting is the only means the pedigree breeder has available to ascertain which hens he can use for his stock pens from the production side; he cannot possibly get to know the quantity of eggs each bird lays, or is likely to lay, from her appearance or even by handling her only, so he must put the hens through the trap-nests. The importance of his having accurate individual records of the whole of his breeding stock as a guide in the selection of them becomes very evident when it is known that some birds which have every appearance of being good layers, and even some which have passed the handling test, may be actually low producers or not up to the standard for stamina.

Hence, if such failures were used in the breeding pens, it is obvious that their offspring, cockerels as well as pullets, would not be satisfactory.

Flock Mating

Pen averaging is no doubt handy for the poultry-farmer who wishes to produce strong stock. In this case a number of pullets are selected by handling and kept solely for laying during their first season; and provided the total production of the pen is such as to represent a fair average, the whole of them would be put into the breeding pens during their second season, as young hens, although under such a system some of the birds could be exceptionally good layers and others quite the reverse. There might be a chance, of course, that any low producers among them would not lay during the breeding season; and yet, unless the hens were mated in late autumn or early winter, it would probably be the very time in which they came into lay again—in spring. However, the specialist breeder of laying stock must not leave anything to chance; so the pen averaging method is certainly not one he should adopt.

It is such mating as this, flock mating as a rule, which has had much to do with disappointing averages on some egg farms, but they are what the breeder strives to avoid, because he must eliminate the poor performers. Unprofitable pullets cannot always be detected before they commence laying, although an expert handler should be able to do so before the season has advanced many weeks; but if the traps are in use, and individual records of the birds are taken, the worst producers can be removed from the flock altogether and, if not disposed of at once, then so identified that they shall not be put into any breeding pen. Here, then, is one very good reason for trapping—and if it were not for the extra labour it entails, the system would be in vogue on all commercial egg farms.

The Trap-nest Described

However, before going into the details which must necessarily be carried out when birds are being trapped, it will be as well, perhaps, to describe the actual trap-nest. The only way in which it differs from the usual nest box—which is fully dealt with in Chapter III in connexion with the essential fitments for the laying house—is that it is fitted with a front so arranged that the bird is free to enter but cannot leave until she is released; hence she is trapped. Trap-nest fronts of various designs are obtainable from most poultry appliance makers for a shilling or so; and if samples of three or four different kinds are tried, the handy man can copy—for his own use only, but not for sale—the one which he finds most suitable. As a matter of fact, though, their very cheapness is such that to make them at home is scarcely worth the trouble and the few pence saved. The simplest I have used is one in which the trap-door —made of three-ply wood—works in grooves, so that, as the hen enters the nest box, she raises the door slightly with her shoulders, thereby releasing the catch and allowing the door to slide quietly into place when she is inside—the traps must be silent in working.

It is perhaps scarcely necessary for me to suggest that when trap-nests are in use they require almost constant attention throughout the day, and at least every hour or two. This is especially so during the morning, when the birds generally use them more frequently than at other times; and it is desirable to liberate the hen soon after she has laid, in order to prevent her becoming restless and thus probably breaking her egg. On one establishment I visited

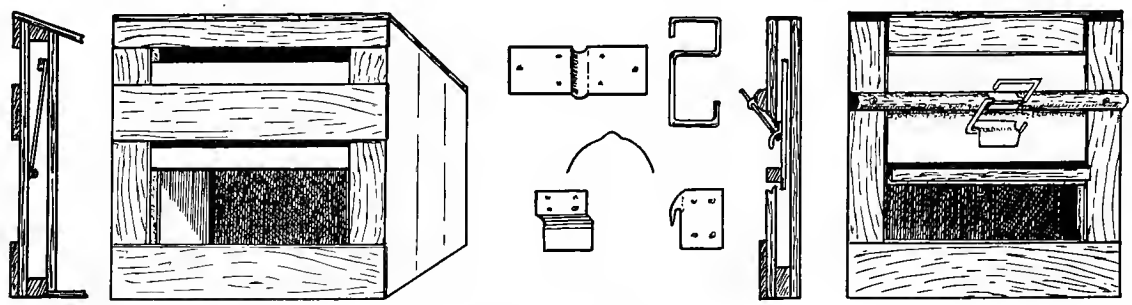


FIG. 222. TRAP-NESTS

On the left, a simple trap which, as shown in the section, rests on bevelled ledges—one at each side. The door is made of three-ply, weighted at the top with an oak bar. When the trap is closed there is a 2-in. space above the cross-bar

On the right, a trap used at the Middlesex Laying Test, and invented by Mr. Worthington, the county poultry instructor. The door is made of aluminium, weighted at the bottom with a bar of wood. The specially-bent wire catch is swung on a fixed half circle of wood. Of the two door plates—seen at the bottom, centre—that on the left has proved the better

In each of these nests, the door is released by the bird lifting the trap on entering; she is then confined until taken out by the attendant

some time ago, the trap-nests had exits, so that each hen could release herself into an outside wire cage, and thus the attendant was able to take full particulars without entering the house. In my opinion, however, it was merely a fad; it did not relieve the attendant from entering the house to re-set the trap besides which it added considerably to the cost of fitting the place, without, as far as I could see, the least benefit to the birds.

No great difficulty should be experienced in getting fowls accustomed to trap-nests, provided the nests are of a simple design with nothing to frighten the birds or make them suspicious, and that they are easily accessible. I find it beneficial to fix the doors during the first few days in which the pullets are put into their trapping quarters, so that they can enter or leave at will. Many of them are nervous little creatures when they are coming into lay and like to wander in and out of the nest boxes. To permit them to do so is better than forcing them to deposit their eggs on the droppings' board or the floor of the house. Putting a "pot egg" into each nest generally proves an attraction; and, of course, there should not be any other place in the house or the run which offers the birds an attractive spot in which to lay. Should it happen, however, that an egg is found outside the nest box—as is sometimes the case—the matter must receive immediate attention, because it is very probably due to an insufficiency of nests or not keeping the nest material clean. Of course, these "stray" eggs must not be recorded, although I have actually known it to be done, the owner declaring to me that he knew, from the shape of the egg, which pullet had produced it—which was knowledge, indeed!

The attendant should not haunt the house too closely while laying is in progress, even though the birds be thoroughly accustomed to him, since at such a time pullets generally prefer to be left to themselves, although with old birds it is different, because scarcely anything will upset them when they are nesting to lay. However, it is perhaps as well to keep an eye on the nests for the first week or so, to release any birds which take to cackling—as some do, whether they have laid or not—and thus obviate any chance of a broken egg. Care is necessary all through the work of trapping; the pullets must be handled gently but firmly from the beginning, so that they will soon get accustomed to being taken from the nests, having their identification number examined, and being deposited gently on the floor—on no account should the bird be thrown down or released from a height. Patience pays in these matters, because the constant handling of the birds makes them tame, which results in the flock being much easier to manage. Moreover, it increases the production; and it gives the attendant the opportunity of observing any ailment in its earliest stages, so that isolation and treatment can be applied before damage has been done.

Some Observations

Some observations I have made during the trapping of pullets will probably be of service to those who are commencing to use trap-nests. I find that the bulk of the day's eggs are laid before noon, but they may also be laid up to shutting-up time in winter, and occasionally after the birds are closed in—and a few perhaps while the pullets are perching. When laying takes place late in the day, the birds which then lay do not produce eggs on the following day; it may simply mean that such pullets are at the end of their first clutch, with a break for more than a day, but in this case the next eggs are often of increased size. High producers almost invariably lay early in the day; but all early layers are not necessarily high producers, although a consistent early layer usually proves to be a good producer. Pullets of the light and non-sitting breeds, such as Leghorns, generally lay early, and they occupy the nest box for a comparatively short time; but they are so nervous that they are apt to break their eggs unless promptly released —when attending to them be careful to lift the traps gently, otherwise the inmates may positively fly out of the nests.

General-purpose breed pullets—as, for instance, Rhode Island Reds, Light Sussex and White Wyandottes—spend more time on the nests before depositing their eggs even when there is no intention of their going broody; and they are sometimes nesting at 6 p.m. If a pullet which commenced to lay in October does not produce 2 oz. eggs before the end of three months, she is scarcely worth marking as a breeder. The egg charts should not be hung in the fowl house, where they are apt to get dusty and, moreover, cause delay in attending to the trapped birds, as well as necessitating the carrying around of scales for weighing. Keep them, with other records, indoors in a safe place, but have a monthly egg card, ruled and numbered for each hen, over the trap-nests as a check on daily production. When entering up the weights let 1 represent a quarter (ounce), 2 a half, and 3 three-quarters in the second column; thus, 2–1, two and a quarter ounces, 1–3, one and three-quarter ounces.

Pullets should be trapped for a full season (up to a year, if necessary) from the day they come into lay, or, at any rate, from the first day on which the traps are in use. Some poultry-breeders do not consider it necessary to record their pullets for longer than the winter production, generally from October to January; and they presume that, if the average for that period is fifteen a month, the bird will finish her first

season with a good total. Others are satisfied with fifty eggs in one hundred consecutive days from 1st October, or from the day on which the pullet commences laying in autumn; and yet others select, for running on as future breeders, those pullets which lay a score of eggs during the first six weeks of production. But these are not dependable methods for the specialist breeder, and he must get the full season's record.

Each bird which is being trapped must have an identification mark—in the form of a wing band or a leg band on which there is a numeral—so that after

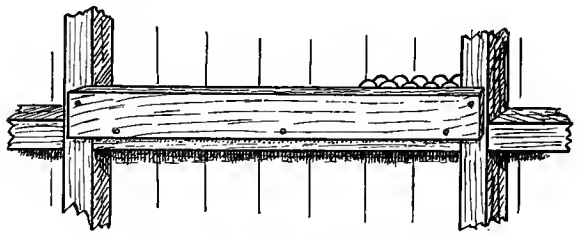


FIG. 223. AN EGG TROUGH

A trough similar to the above is handy as a temporary storing place for eggs collected at odd times before the usual egg round. It is made by screwing a piece of board against the inner framework of the house, and it should contain a handful of sawdust

she is examined and released from the trap-nest, that numeral is distinctly pencilled on the egg, while if more than one lot of pullets is being trapped the letter or numeral of the house—the former is preferable—must also be noted on the egg. Trap-nests, of course, must be used in each pen, and at least two will be required for every five birds, often one for two, with Leghorns, if the attendant has many other duties to perform. Care must be taken not to shake the eggs, and also to prevent their freezing in cold weather. A small trough lined with hay and fixed against the wall of the house or at one end of the nest boxes—but well out of the birds' reach—is a handy place in which temporarily to keep the eggs if the flock is a large one, the pens are numerous, or the fowl house is some distance from the egg room.

To ascertain the number of eggs produced by each pullet is not the only purpose for which the traps are used, since, in addition to the keeping of such records, notes will have to be made of the weight of each egg, its shape—if abnormal, as some are occasionally—and the colour and texture of its shell. These are matters which are best done indoors when the day's work is over; and, if many birds are being trapped, it entails much booking and is something akin to hard labour until one gets accustomed to it. But pedigreeing—for as such is specialist breeding known among poultry people, although the word is not to be found in an English dictionary—means much more than recording the eggs, because the breeder has to note the physical condition of the birds during their laying and moulting periods, the fertility and "hatchability" of the eggs which are incubated, and the "rearability" of the chickens, as well as their rate of growth and condition at different periods.

Some breeders go to the extent of weighing their pullets as each bird produces her first egg, and then monthly throughout the whole season; but if they are weighed at the beginning and the end, as well as every three months, it will be sufficient to enable the expert attendant to ascertain their condition, because he will get a very good idea of the birds' bodily weights each time he handles them out of the traps. And there are still other particulars to note, such as the periods of rest between clutches of eggs, broodiness, neck moulting—all of which may occur—and the date of moulting.

Minute Details Necessary

The whole of these details are necessary, while there are records to be kept in connexion with the male birds, if such are being reared on the premises. Specialist breeding entails much booking, and when it is undertaken on anything like a big scale it is one man's task, and no light task either. Moreover, the book-keeper must be particularly careful to avoid mistakes, the records in the registers being entered in such a way that a stranger inspecting them would know that they were genuine; records are useless to the breeder unless they are kept with strict accuracy. However, the beginner will not make the error of attempting to run before he can walk. He will be wise to commence with two small pens of pullets, trapping and recording the birds during their first full season of laying, and also in their second season after they have moulted—and, subsequently, with their progeny—provided the records of the first year have been such as to warrant the hens being used as breeding stock.

The breeding of layers on such a scale could well be undertaken by the beginner as a side-line to his other activities in poultry-keeping; and if he be careful in his observations and bookings it should enable him to gain much useful information. But he must not expect to establish his own strain of layers or line of male birds in a couple of seasons; he will be very fortunate if he approach it in ten years, because there will be failures, birds which do not come up to the standard he has in view. However, if it were "as easy as ABC," there would really be little in it. Once he gets well into the work he should have collected and tabulated a mass of valuable information, and will know which birds to keep for breeding purposes and which to avoid. He would be foolish in his own

interests if he retained any which did not possess or was losing some of the desirable factors which combine to produce the sturdy layers and breeding stock for which he is aiming; but he would be equally foolish to aim too high at the start, because care and skill are required to build up gradually—there are no short-cut methods. The expert breeder does not hesitate to discard a bird which fails to come up to the standard he sets; a yearling hen trapped with a very high record may be unsuitable to use as a breeding hen, although quite fit to keep for egg production in her second season. Such, then, are among the failures, but it is only by overcoming reverses of this kind that success is achieved.

I have said that pullets should be trapped and recorded during their first full season of laying, and also that notes must be made of the date on which they come into moult. When the moult commences, or shortly after it starts, laying ceases; hence, the birds which are moulting do not require trapping, and, indeed, they should be removed from the pen and put into well-sheltered and reasonably warm quarters, but not confined to a house or shed. This is necessary to ensure their getting a change of diet and to prevent their being bullied by the other pullets, because the strongest of layers almost invariably gets slightly below par while moulting. Moreover, they naturally require a greater measure of protection from inclement weather, as the moult usually begins in autumn.

An eye will still have to be kept on them, because their records will have to include dates of commencing and re-furnishing, and any particulars concerning their condition—some birds seem to drop most of their feathers almost at once, others make the change of plumage so gradually that the moult is hardly perceptible, while there are those which may experience some trouble in re-furnishing, in which case, of course, they will require attention. It is generally considered that pullets which moult early in the season are not as good layers as late moulters, and that any bird which shows complete new feathers by 1st September is an early moulter and should be discarded as a poor producer, because she moults slowly and remains out of production for a considerable period. But, while this may be detrimental for the commercial egg-farmer—although that is questionable if the pullets are being managed by one who understands the feeding of layers—it is by no means so for the breeder, if the early moulting pullets have good winter and spring records.

The trapped pullets which moult early, and which have given good production through winter and spring, should be allowed to range freely as soon as they start their moult; they will then go through their change of plumage easily and store up the energy so necessary to enable them to be mated in winter. Late moulters are sometimes a source of anxiety, particularly if the weather change suddenly; hence they require a little extra attention, although there need be no fear of their not being ready for the early breeding pens, when managed on common-sense lines. It is advisable to get the stock hens settled down in their breeding quarters some time before December, and to introduce the cock or cockerel about a fortnight before the first eggs are to be collected for incubation. It is generally found that the best layers come from the earliest hatches of eggs, a fact which impressed me, years ago, with the futility of breeding in spring from heavy winter laying pullets.

The Breeding Pen

Having made a selection of the pullets after they have moulted through at the end of their first year of trapping, the birds will have to be mated. The difficulty with the novice will be to know which of the pullets are worth trying out in that direction. If he be keen on breed type—as I am, maintaining that all pure breeds should resemble in general characteristics the standards set up for them—that would be his first consideration before a pullet is trapped. I do not wish it to be inferred from this remark that each bird must be a 100 per cent standard specimen, but that, for instance, a Wyandotte should not be merely a Leghorn with a rose comb. This question of type is a somewhat important one if the breeder desire to sell his stock under a specified breed name; hence it would serve no useful purpose to trap pullets which failed too much in general characteristics, since any faults they possessed would probably be further exaggerated in their progeny. Combining type with egg production for the breeding stock is not an easy matter; yet it is one that is engaging the attention of some of the foremost breeders to-day, which indicates that it is of importance.

Then there must be stamina; and, omitting any consideration of breed characteristics, it should come first. As I have previously remarked, a hen's egg yield depends not so much upon the potential productive character she may inherit as upon her actual individual physical characters. A pullet should be chosen which has finished her first season of trapping without a day's sickness and has passed through her moult normally without lessened vitality, because her record will show that she is not a low producer. A bird which has sufficient stamina to keep in lay for almost twelve months—although by no means indeed on every day of that period—is likely to pass on such vitality to her offspring.

The size (or weight) of the egg and the quantity

which has been produced by each bird are important matters for consideration when the young hens are being selected for the breeding pen. These particulars will be available on the egg charts, since the eggs are weighed daily, as they are brought in, and their weights recorded. This will enable the breeder to ascertain the date on which each reached the 2 oz. mark; and those pullets which were laying such eggs within the first month, and kept up or exceeded that weight, should be specially noted when the breeding season is in view. When examining the records at mating-up time it will probably be found that the pullet which has laid in steady sequence at the rate of four or five eggs a week during the winter months has put up a better score for the year than the bird which was a daily producer for the first three or four weeks and then took a long rest before she again laid; and the former pullet will generally make the better breeder.

It sometimes happens that small eggs are produced by the daughter of a hen which was bred from because of the good size of her eggs; but in these cases, provided the pullet's full sisters—out of the same batch, and, of course, the same age—are laying normal eggs, it generally indicates that she has had a check during her growing period. Such a bird, even if good in other respects, should not be bred from in her second season but trapped for a week or so after she has moulted through and restarted laying, to see if large eggs are forthcoming, in which case she might be tried out forthwith, or marked down as a third-season breeder. Most pullets of this kind, however, are better retained solely as layers and not put into the breeding pen, because there are too many producers of small eggs at the present time.

Consistency of Production

As regards the numbers of eggs, pullets with totals of about 200—under rather than over—have proved to be particularly good dams, especially if they laid something like twenty eggs a month from the time they started (in October) and for the following four or five months. I have heard of excellent results from a hen whose total was very much less than 200 eggs for her first full season of production; but she had a most satisfactory average for the winter months and was, admittedly, an exceptionally well-bred bird.

In my experience, however, the good winter layer is of much greater value as a breeding hen than the pullet which produces the bulk of her eggs in the natural laying period of spring and summer, while as a rule she finishes her trapping year with an increased rather than a diminished bodily weight. Whether this would be so in the case of a pullet which had put up a score of 300 eggs or more—as some birds have been recorded, under official testing—I

FIG. 224. BREEDING PENS

Excellent accommodation is here provided for single breeding pens, no more than a dozen hens being mated with one male bird, and each mating distinct. These pens, beyond the path, consist of Rhode Island Red and Light Sussex; and, as can be seen, the houses are substantial, the grass runs spacious, and the fences boarded to a good height. In the foreground are flock-mated White Wyandottes, that is, several male birds are run with the hens—in this case one to every ten. This latter method is frequently adopted for the production of pullets to re-stock commercial egg farms

cannot possibly say, because I have never bred such a one; but I can quite imagine that a hen with an exceptionally high record would produce infertile eggs if used for breeding early in her second season—as soon as she had furnished-up from the moult following her laying performance. However if a 300-egg pullet ever came into my possession, I have my own ideas about how she would be managed in an attempt to make her strong enough for the breeding pen in her third year. The most vigorous chickens, and the best laying pullets, I have had have been bred from hens which had good winter records in their first season; and this was because they had not stored up all their energy to begin laying an egg a day only as soon as spring arrived, and yet the production of such hens as the former throughout spring and summer is generally better than their winter average. To be carried through for complete records the second-season hens, as well as the pullets, should be trapped, as it will enable the breeder to ascertain which of his birds lay nearly as well in their second season as in their first.

From the commercial egg-farmer's point of view this matter of consistency of production is one of great importance. The heavy cost of replacements each year renders birds which will lay well for two seasons very valuable stock for him, since he would be able to effect a considerable saving if he could keep a large proportion of his birds for a second season. By trap-nesting with that object in view, therefore, the breeder would have hens from which to breed pullets with similar qualities; and although he might then have to rely largely on third-year hens for his breeding pens, he would not find it detrimental in the least, because, provided the breeding birds are of undoubted health and stamina, their age has nothing to do with the vigour of their offspring. The breeder who traps his second-season hens is able to make some very useful comparisons between the dams and their daughters; and perseverance in breeding for consistency may possibly result in its being profitable to keep a percentage of third-year hens as layers.

FIG. 225. PEDIGREE WHITE WYANDOTTES

Ten sisters, daughters of a White Wyandotte hen, which produced 507 eggs in twenty-four months

The most profitable hens for the specialist breeder are those which put up satisfactory records over a number of years; and one of the best stock hens I noted was a White Wyandotte which, by laying 141 eggs in her fourth season, brought her total up to 683. "Long-distance" layers such as that hen are reliable breeders. So much, then, regarding the hens for the breeding pens. There are many points to observe; and there will be plenty of weeding-out when the year's records are being examined before the breeder reaches his ideal. But let stamina stand high in his selection, first and foremost if he has not, as I have, a weakness for breed characteristics.

Choosing the Male Bird

Now, let us consider the male bird, because, of course, a breeding pen cannot exist without him. It is an old saying among poultry fanciers that the cock is half the pen. In practice, though, when breeding

for egg production is being undertaken, he is more than half, and, as a matter of fact, much greater care should be exercised when selecting the male than in choosing the hens, because every chicken in the pen will be influenced by him. There was a time when the most important matter connected with the breeding stock was considered to be choosing the hens which had put up high records in their pullet years, the higher the better, and little thought was given to the cock or cockerel, as long as he looked fit. However, of recent years his value has been recognized by specialist breeders; and improvement in egg production has been brought about largely through the selection of sons of high-producing hens mated with hens having good records as pullets.

There is no doubt that this policy has raised the general average production above the level existing when the male birds which were used in the stock pens were, at best, chosen for their activity and appearance, without any reference to their dams, although, let me remark, there was much sense in selecting "the cockerel which crowed the earliest," because such a bird is invariably possessed of vigour. Generally speaking, the male's breeding type and physical qualities must be of the best; and he must answer to the handling test and other points enumerated in Chapter IV. It is as well to recollect that he carries within himself, with power to transmit to his progeny, the egg-laying qualities which he has inherited from his mother, and to which he cannot himself give expression, simply because he is of the wrong sex to produce eggs. Hence the necessity for the male bird which heads the breeding pen being of high-record parentage.

The importance of very careful records being kept of the sires as regards their progeny (of both sexes) is obvious when it has been found that pullets sired by birds from highly productive dams only may not be good producers. The ideal sire is one belonging to a line of "proved" breeders; and it is to get this stamp of male bird that progeny testing is advocated. But, while it is asserted by some authorities that progeny testing is the only way in which the greatest progress can be achieved in breeding for increased egg production, the whole process—much more tedious and complicated than the recording and breeding of the actual layers—is spread over so many years that some breeders might hesitate to attempt to undertake it in these days as a commercial proposition. A few years since, admittedly, male birds of a famous American strain of layers were sold at a thousand dollars each; but while the advanced breeders in America paid those high prices for their breeding males, nothing like such figures change hands for stock nowadays.

The Progeny Test

To give some idea of what this progeny test can entail, let me quote briefly from what is being done at The Dominion Experimental Station, Harrow, Ontario, Canada—

> The breeding work . . . is an effort to establish several blood lines, each carrying one or more of the following desirable characters: Standard qualifications, high egg production, good size of egg, uniform body weight, good colour of plumage, and good colour of egg-shell, with due regard to vigour. Then, by careful crossing, new lines will be established that may be prepotent in most, if not all, of these desirable characters.

There can be no doubt that the breeding of male birds by such an elaborate system for improved egg production is beyond the scope of the breeder whose chief aim is to cater for the demand among commercial egg-farmers for ready-to-lay pullets. Nevertheless, it might well answer for those whose birds compete at Laying Tests, because it is highly probable that the prices obtainable for male birds of a "proved" line would more than compensate one for all the time, labour, and expense it involves. For the usual purposes for which laying stock is bred by private enterprise—as is the case in this country—I am afraid that breed-standard qualifications, particularly in the matters of type and plumage colour, have to take a back place, as the principal consideration is increased egg production. It must be admitted that vast improvements in this direction are being made in the birds which now compete as "utility" stock at poultry exhibitions; but, as a rule, they are not those which score highly at Laying Tests, proof of which is seen in the general lack of breed-standard points among hens which are penned in classes for "copper-ring" birds.

However, the breeder who would take up progeny testing for his line of male birds should commence by using in his breeding pens cockerels obtained from breeders of repute; it is a waste of time to buy inferior birds for stock. When negotiating for the purchase of such a cockerel, full information should be sought regarding the records of the pen from which he has been bred; and he should be selected not so much for the individual yield of his dam (as a pullet) as for a consistent record of egg production of the dam's sisters—high, of course, rather than low records.

For example, if the cockerel chosen for the breeding pen be the son of a hen which had produced, say, 220 eggs in her first laying season, and several of her sisters, which were trap-nested at the same time, had been recorded at a somewhat similar level, he is likely to give much better results—obviously, provided his being mated with suitable breeding hens—than the

son of an outstanding dam, such as one which laid 250 eggs but whose sisters' totals varied from 160 to 200. These figures, of course, are quite fictitious, and I use them merely to illustrate the point that the cockerel should not be selected on his dam's record only. It has been stated that a pen of hens which was mated with a cockerel from a 206-egg hen gave infinitely better results than one from a 272 dam; but this would simply mean that the latter dam was the outstanding pullet of the mating by which she was produced. There are breeders who mate their high-producing hens with cockerels whose dams have not exceeded the 200 mark in their pullet year, while other breeders consider that no cockerel should be bred from unless his dam has a 250-egg, or higher, record. Whatever the dam's record, nevertheless—provided it is not that of a poor producer—it is infinitely more important when mating up the stock to choose a cockerel with characteristics which denote stamina than one lacking them, even though the former may be from a dam of a 180-egg strain, and the latter the son of an outstanding 250-egg hen.

The Value of the Sire's Line

As far as my experience goes—and it is borne out by some records I have at my disposal—I feel sure that more progress is likely to be made in improving the average egg production of a flock by using the son of a fairly high-producing dam than a cockerel from a low-producing hen, granted that both of the male birds are of undoubted vigour, and also that the egg records on the sire's side (through his dam's family or strain) should exceed those of the females which are picked to form the breeding pen. Just as it is beneficial to select hens which have a satisfactory winter record—and even fifteen eggs a month through that season is by no means bad—so it is preferable to pick the young males from the earliest hatches of the year, i.e. from the winter chickens.

I find that a fully-furnished and vigorous cockerel and a well-moulted and matured second-season cock are stronger breeders than older male birds, although a "proved" cock is well worth breeding from for as many years as he maintains his vigour. However, when one is commencing to form a strain of layers or a line of males, the younger birds should be selected, because the most desirable factors are more fully transmitted when the breeding males are at the highest phases of their vigour. Similarly, hens in their second and third seasons of production are generally better than older birds when size of egg is desirable; but only for exceptional purposes should pullets in their first flush be put into the pens. To test them simply for their winter records and then to breed from them in the spring—so frequently the case when quick returns are desired—results in inferior stock. The only occasion on which pullets can be serviceable for stock is when pedigree-breeding is adopted, or when table chickens or show (exhibition) birds are required. The specialist breeder's work is slow; it must be slow, particularly when breeding for a male line.

In this latter case, one has to keep almost innumerable details spread over a very considerable period, because, however good the male bird may be, it is too much to expect that he will pass on to his offspring 100 per cent of all the features which are desired; and it is only by establishing several lines and by careful crossing—as mentioned in the work being carried out at the Dominion Experimental Station, to which I have already referred—that the ideal is likely to be reached. It entails trap-nesting and a careful system of recording, because the full value of whatever qualities the first males used in the breeding pens have passed on to their progeny cannot be ascertained until their offspring—the very pick of them, as they must be well culled—have reached maturity and been passed through the breeding pens and the trap-nests. It means recording the results of hatching and rearing before those stages are arrived at, since they have an important bearing on that very essential quality, vigour. The registers of the specialist breeder make interesting reading, because not only do they record successes but failures also; and it may well be said that, in the breeding of poultry particularly, success is achieved only by those who can overcome their failures—by analysing them and applying the results to future operations.

Pedigree Hatching and Rearing

The breeding pens may be said to be the beginning of things, because few if any poultry-keepers would go to the trouble of trap-nesting their layers except for the express purpose of selecting suitable birds for stock. The expert at egg-farming handles his pullets not only prior to their coming into lay but at different periods, and especially in the flush seasons of late winter and early spring, when the last of the doubtful producers will be culled out and sent to market. And here let me digress for a moment—many such birds, when killed and dressed, will make as good table fowls as pullets some months their junior, by the very simple expedient of hanging them for a few days. But, that is not pedigree work. The eggs to be incubated must be carefully examined, because the shell texture must be such that the chicks shall have every chance of hatching out on the twentieth or twenty-first day; they must be properly stored, and set within a week or so of being laid, matters which have already been dealt with in Chapter V.

All I need add to them is that, when artificial

incubation is the method adopted, each machine will require an extra tray or trays (fitted with special divisions or cages, or muslin bags for the purpose of accommodating the eggs) which will be used on the eighteenth day, because it is at that stage of incubation that the eggs have to be finally tested and sorted for identification at hatching time. Otherwise they can be set under hens, which some breeders prefer, since it ensures small units. In this case, though, the eggs must not be mixed; that is, each bird which is

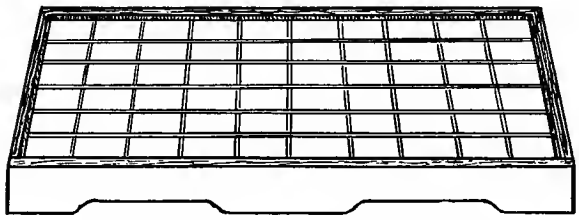


FIG. 226. PEDIGREE HATCHING

A pedigree egg tray, partitioned for sixty eggs, for the artificial incubator

set must have one hen's eggs only, because, while the attendant has control over the chicks which are hatched in trays in an artificial incubator and can distinguish the different numbers as soon as the chicks are out of their shells, this is impossible when the hen is incubating, if for no better reason than that he cannot be on the spot as each egg hatches, even granted they hatch at different hours.

At some pedigree poultry farms, all the eggs from each pen are given an extra distinguishing mark before the trays are filled—each egg already having on it the hen's numerals—this mark being in the form of a large spot on the side of the egg, not the end, or as a band completely round it; and a different colour is used for the eggs from each pen. This greatly facilitates the work when large incubators are in use, since the pen-marks enable the operator to separate the eggs with ease when those from any special matings are being prepared for the trays on the eighteenth day.

It is during incubation that the breeder has the opportunity of ascertaining his information concerning that important factor, hatchability. Bad hatchability is inheritable; so birds which do not produce a proper proportion of hatchable eggs should be excluded from future breeding pens, and, indeed, removed from the pen as soon as possible and put into the flock of layers, because they will probably be worth running on solely for egg production until they are nearing their moult. This defect should not be difficult to detect, because each egg can be traced to its producer by the hen numerals on its shell. In my opinion, hatchability is a point which deserves greater attention than is generally given to it, because hens which produce a large percentage of unhatchable eggs are by no means always lacking in vigour.

It must not be thought that hatching is the least important part of the work connected with breeding, because it calls for particular care and no small knowledge of incubation and the handling of eggs. Each egg must be so marked that the chick which may be hatched from it can be easily identified—even after thorough testing on the tenth day of incubation, and with clear eggs, etc., removed, it is not always that every egg left in the machine will produce a live chick. The individual marking of the chicks, however, is essential, so that growth may be watched and carefully recorded, since the breeder will then be in possession of valuable knowledge when making selections for future breeding pens.

In the Incubator Room

The incubator room will contain the hatching chart on which there are columns for the hens' wing and leg band numerals, numbers of eggs set from each bird, results in clear (infertile) and addled eggs, dead-in-shell, the chicks hatched, together with a final column for remarks, such as the condition of the chicks when hatched. Trays with divisions or cages, or muslin bags (each of the bags about 6 in. by 3 in., to allow the chicks plenty of room in which to get out of the shell), as well as a piece of thick blanket larger than the egg tray, and small card tabs (on which each hen's number will be written, when necessary) for fixing on the cages, or putting into the muslin bags, must be handy, while the bench on which the eggs are aired and turned in the usual course of incubation should be in a good light, and the testing lamp prepared. Working on modest lines, as the beginner is advised to do, he will probably not have the room fitted out with electricity and a reflector box installed for egg testing, so he must work by the usual egg-tester.

It is during the eighteenth day's work that an assistant is necessary, because even when only three or four single-tier incubators are in use, one operator can scarcely do all the work unaided, and, moreover, quickness is essential to prevent the chilling of the chicks. If muslin bags are employed, a spare machine will be required, because extra room must be allowed for each egg in its bag, and there must, therefore, be an incubator for those which are likely to be over. This spare machine must be started a couple of days in advance, so that it will be running at the temperature required on the eighteenth day; and the special trays or muslin bags (in a box) and the blanket can be put on it to warm up, since there must be no chance of the unhatched chicks getting a check by chilling.

All being in readiness, each tray must be removed from the incubator to the bench—the light being dimmed—the eggs rapidly but thoroughly tested, faulty ones set aside, and the tray returned to the machine. When the whole of the eggs, in all the machines, have been examined, the operator will know how many divisions to make in the pedigree tray, or the number of bags required; so let them be prepared, and handy. Each tray must then be again removed; and according to the method adopted so must one proceed. If the eggs are to be bagged, the tray must be covered with the blanket as soon as it is put on the bench, the eggs taken from beneath it one at a time, the hen's number written on a card tab by the assistant, card and egg put into the bag, securely tied, and returned under the blanket. As soon as the tray is reasonably full it should be returned to the incubator, and any eggs which remain, bagged, etc., and placed into the spare machine. When trays with divisions are used, the eggs need not be covered with a blanket as each tray is removed for sorting, because they are quickly transferred to the sections or cages, although they must, of course, be tabbed.

It will be understood that the incubator room must be warm and free of floor draughts, as I mentioned in Chapter V; it is especially necessary when eggs are being checked up and bagged. The operator—and his assistant also—should work with warm and clean hands, the latter essential, of course, no matter whether the eggs are being incubated or collected for market. However, to continue with the hatching or rather the incubation. Any faulty eggs should be scored on the hatching chart against the hens whose numbers they bear; and eventually examined to ascertain, if possible, the stage at which the germ perished, and to note down particulars under "Remarks" on the hatching chart. The eggs should be left in the incubator until the hatch is over, but those in the muslin bags will require attention once or twice after they begin to star, to ensure the chicks being able to release themselves, and to leave room for later ones to do the same.

It is advisable to have a supply of leg or wing bands or tabs handy for use when the chicks are being taken from the incubators on hatching-out day. The operator will gather from his figures on the hatching chart how many will be required; but beyond having them where they can be easily got at, little can be done until the chicks are actually hatched. The bands or tabs can be plain (or numbered consecutively by the makers); but in any case the hens' numerals should be punched on, although only as required. I once—and once only—prepared a set of leg bands ahead of hatching time, numbering them according to the eggs left in the machine; but, although they were very carefully pegged in a convenient place, sorting them through to get their numerals to tally with those on the card tabs convinced me that each should be prepared only as it was wanted. The bands and tabs being of aluminium or soft metal (and flat), and the punches of steel, it is a simple matter to prepare the numerals with a stamping tool—one similar to a leather punch, but with a letter or a numeral on each arm of the wheel, is decidedly handy.

Marking the Chicks

Some breeders use wing tabs, others bands, and they are fitted on at hatching time, the former having a pointed end, being pierced through and clipped, and the other fitted by punching a minute hole in the web of the wing and putting the band through it. Nevertheless, many prefer not to use wing bands until the chickens are five to six weeks old, because when applied at the day-old stage they are apt to interfere with wing movement as the bird grows; but, after all, wing bands or leg rings of any kind need attention until the chickens are fairly well advanced.

This marking of the chicks—immediately they are taken from the incubator tray—can be done by toe-punching or by the use of celluloid leg rings of different colours; but this is advisable only when the progeny of a pen, rather than of any special hens, are being recorded. All details of numerals, etc., must be carefully noted down at the time of hatching, and then transferred to the permanent chick-recording books, with such other details as strain (family) or pen, date hatched, sex, and eventually particulars of growth. The stock book should contain records of matings, results from the hatching charts, and the ring numbers of the progeny. On the day of hatching, when ringing, etc., have been completed, the chicks should be put into the ordinary chick travelling boxes in small numbers—a dozen to a score—and kept there, in the dark, for at least twenty-four hours, instead of being placed under the hover in the usual way.

At the age of five to six weeks it is usual to change the leg rings for those of larger size—if leg bands are being used all through—and again at three months, when permanent sealed rings should be put on. Some breeders transfer the leg ring to the wing—punching a hole in the web for that purpose, after washing the ring in a disinfectant solution—or they fix wing bands, which are, of course, permanent. Coloured rings are also sometimes used in addition to wing marks, and they are useful to denote different pens. When toe-punching is the method adopted, the holes must be inspected to see that the web has not closed up; a second punching may be necessary, because the identification marks must never be lost. For the reason that numerals on the leg rings are apt to

become obliterated and the rings themselves to cause trouble, some breeders never use them beyond the month-old stage; but it matters little which method of identification is adopted as long as it is plain and permanent.

Growing the Birds

The brooding and rearing of the chickens should follow the usual lines, because excellent results can be obtained by artificial as well as natural means; but, while some breeders adopt intensive methods, I am greatly in favour of the semi-intensive system with large runs for the rearing of stock chickens. The birds should be brought along on Spartan lines, with plenty of fresh air, and, from their off-brooder stage, accommodated in Sussex arks or similar houses; and as they will be getting sound food and be kept clean, those which survive—and few rearers go through a chicken season without some casualties—will be hardy enough for most purposes. The sexes should be separated at an early age and each reared well away from the other. Grading and culling must be frequently carried out and full notes made; and on no account should a bird be kept for breeding if it has not some good point the breeder wishes to develop.

It is essential that the chickens never receive a check in development, because a bird which does so seldom completely recovers at any period of its growth, while if it be a pullet the result will most probably be that she produces small eggs during the whole of her career. The attention must be such that the chickens are always kept growing; they must be generously fed but not overfed, with good wholesome food and plenty of it; well housed but never coddled; and always kept active and alert. A mistake too frequently made by beginners is to attempt the rearing of more chicks than can be properly attended to or given adequate accommodation. A single brood well managed will produce much better results than a large one neglected; and birds cannot grow on land which is foul from overcrowding.

Although the difficulties of breeding poultry for egg production are great, the breeder must learn to overcome them. He must profit by his mistakes, investigating the cause of the trouble and resisting the temptation to blame something else when he should blame himself. If immunity from disease is ever to be assured—and I firmly believe it to be possible—it will be done only by breeding from stock of absolutely sound constitutions, and by rearing their offspring in the manner I have suggested. Birds with any sign of weakness, no matter how good their ancestry, must be killed and burned, while those dying from some cause which is beyond the breeder's knowledge should be sent to someone specializing in the post-mortem examination of poultry.

Moreover, in my opinion no bird should be used in the stock pen until it has been blood-tested by a competent authority and certified as free of pullorum disease. It costs little but saves much; and those who have bred from a pen in which there has been a "carrier," male or female, and attempted to rear the chickens, are aware of the havoc which that disease known as bacillary white diarrhoea plays among the broods. But every stock bird which is certified as a non-carrier should be registered to the extent of wearing a sealed and numbered metal leg band or wing band, and the certificate given for it should bear such identification marks. However, I advise those who breed fowls to have their stock birds blood-tested.

Establishing a Strain

Breeding for egg production in its true sense, with all it entails, is unquestionably the most difficult and complicated work connected with practical poultry-keeping; and to bring one's efforts to a successful conclusion requires not only considerable care and skill, but perseverance and infinite patience. To become a successful breeder of any class of bird or animal, it is necessary to establish a strain; but, such are the results of several so-called laying strains of poultry, it is only too evident that some breeders who claim to possess their own are ignorant of what is meant by "strain" when applied to laying stock. The utility side of the poultry industry, however, has developed so rapidly during the past few years that, in spite of the large numbers of poultry-keepers who have taken up the breeding of fowls for egg production, a great deal of misapprehension exists regarding what actually constitutes a strain. Fanciers who breed poultry for exhibition know well that by "strain" is meant a race of fowls carefully cultivated by one breeder for a number of years, and with an individual character of its own, which can be more or less relied upon to reproduce progeny equal to itself. And that is exactly what is meant by strain when applied to laying stock. But whereas the fancier can and does often establish his strain by breeding from one family, or at most two families, the utility breeder does his utmost to avoid such a method, although he can scarcely form his strain without a certain amount of in-breeding.

Admittedly, the fancier's chief object is not to produce record layers but to breed birds which will conform in no small degree to the official standard of excellence which is issued for his guidance by the specialist breed clubs, and by which his stock is judged at the exhibitions. He breeds chiefly for external

points, those which he can see almost at a glance, whether they be the colour and markings of the plumage, the shape and carriage of the comb, the colour and quality of the lobes, body formation and outline, and so forth. All of them are perceptible to the eye; and although he has learnt of recent times that the breeding value of a bird for colour, etc., does not depend so much upon outward appearances as

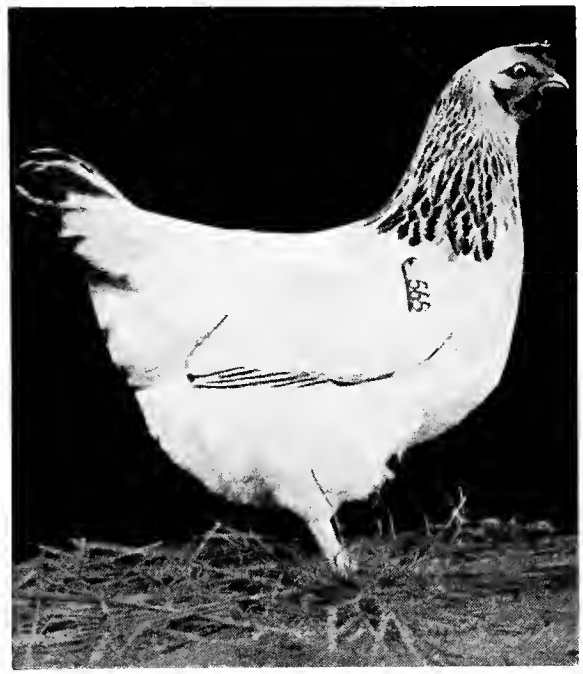


FIG. 227. A LIGHT SUSSEX PULLET

This pullet shows in detail the stamp of Light Sussex bred for laying. She is the daughter of a hen which produced 237 eggs in her pullet year. Note the wing band, which can be read at a distance

upon pedigree in the Mendelian sense, he still relies largely upon outward appearances. He can see how far he has progressed as a result of his matings as soon as the progeny have furnished up, and often long before the chickens have reached that stage; and having noted by which sire and dam his best specimens are reproduced, he marks down such birds' line and does not hesitate to continue that line by in-breeding for as many generations as are possible.

It is by such means that some breeders of laying stock have successfully established their strains; but it is a much longer process, since in order to get the good layer there must be a combination of various inherited factors, which cannot be seen, and the results of which are not apparent until the males have been tested out in the breeding pens and the females put through the trap-nests and then used as stock.

When breeding a strain of exhibition birds it is difficult enough to attain perfection in any of the points I have mentioned; but since the principal factors for which the breeder of laying stock strives lie below the surface, as one might say, it can be imagined how greatly he is handicapped. It is not too much to assert that an exhibition strain can be established in considerably less time than an egg strain; and no breeder of laying stock can rise to the dignity of possessing a strain of his own until he has bred, trap-nested, recorded, and tested the progeny of it through at least ten generations. And, even then, granted he started with uniform stock, he would still find in it room for further improvement, because, of a truth, there is never a finish to pedigree work. I base this opinion on the records and stud books I have been privileged to examine, and, in particular, those of a strain which I was instrumental in starting. A strain, to be a valuable one, should breed true within very restricted limits of what is claimed for it; and that is what the breeder of laying stock must achieve.

Making a Start

There is more than one way in which a start can be made; but one of the best is to get the foundation stocks from four different breeders. This, in my experience, brings the most lasting results, not only because it gives the beginner the chance of producing reasonably good layers within a comparatively short time, but it enables him to have plenty of material from which to select for that vigour which is so very essential for his stock birds, as well as those which are required for commercial production, since it affords him every opportunity of steering clear of too close in-breeding. And in this way of beginning I favour the purchasing of hatching eggs—eggs for "sitting"—in preference to stock birds, because of the much lower cost and the fact that it allows the breeder to record three important phases regarding the quality of the strains, viz. hatchability, rearability, and livability to the stage of furnishing up.

I am, of course, presuming that he who would establish his own strain is not commencing his career as a poultry-breeder, and that he has had sufficient experience to enable him to hatch and rear chickens on common-sense lines. It would be folly otherwise, if merely because eggs from the best hens of laying strains which are offered to the public are not obtainable for a mere song. It is not to be expected that breeders who possess the most famous laying strains in this country—or any other—are prepared to sell eggs from the pick of their stock; and I question if they would dispose of their best birds either, unless, perchance, the whole stud was for dispersal. Nevertheless, those who do have hatching eggs for sale can

be depended upon to supply that which they offer, and thus uphold the excellent reputations they have made. It has been said that anyone starting in the way I suggest, buying his original stock eggs from different sources, creates what is actually a mixture of strains, and nothing definite; but since several generations must necessarily pass in the making of the new strain before it is established on a basis of approximate stability, the amount of hard work and application he has put in can scarcely fail to enable the breeder to possess a definite strain, provided he is big enough for the task.

Founding a laying strain has its surprises and disappointments, and it is essentially a slow process. The breeder who would rush matters and attempt to arrive at the top by short-cut methods courts disappointment, and generally gets it; but he who starts as I suggest will be on the right track. He will find the work decidedly interesting, and not without its compensations at different stages, while it will enable him to keep his stock free of in-and-in breeding for a considerable period.

The eggs must be obtained from four different breeders who will guarantee their own strains being unrelated to others. Then he will have to be especially careful to mark the whole of the birds he uses—chickens and adults—in such a way that those of each particular mating can be distinguished from others. Each bird will have its own number; but, in addition, coloured leg bands could be used. When the chickens are separated according to their sex, which should be done at the earliest possible age after they are off brooder heat, the cockerels will have to be reared and recorded with as much care as the pullets, those of them at any rate which show promise of developing into sturdy adults, because it must not be supposed that the whole of the progeny, even of the very best laying strains, will be 100 per cent perfect. There will be some to cull out; and in this direction the breeder would do well to remember the old fanciers' axiom, "Breed well and kill well." Any bird which shows the slightest sign of weakness should be ruthlessly scrapped, but in any case it should never go into a breeding pen, no matter what its ancestry.

When making a start it is advisable to purchase eggs from only two strains the first year, and the two other strains during the following year, each strain being from a different breeder and, if possible, from a different part of the country. Although change of environment does affect fowls more or less, it must not be supposed that sturdy stock bred in, say, the west of England, would not be able to stand the rigour of a northern climate, or that hardy fowls from the north-east coast would languish in the south, at least, not to the extent of preventing the breeder raising their progeny for stamina.

How to Proceed

In the first year, then, eggs will be purchased from two strains; and, for convenience, let me suggest that the year is 1940 and the strains are A and B. Hatching can take place in January or February; but in any case let all the eggs to begin the strain be put under hens or in an incubator on the same day, so that the chickens will be of a level age, which will greatly facilitate the work of attending to them in the way of housing, rearing, and recording. This is a point the beginner must note until he is thoroughly accustomed to "the sheer slavery" of recording, as one breeder of pedigree laying stock has described it. The first year will be devoted entirely to rearing the chickens, until, if all has gone well, the pullets will be ready for trap-nesting in October; and when starting them remember what I have already said about this part of the work, earlier in this chapter, and record them until they go into moult.

The cockerels will be on hand, at any rate those which have been considered fit enough to rear for stock; but by the end of winter (1940–41) they should be sufficiently advanced to be given a trial run for fertility. Hence in February (1941) or earlier, each of them should be mated with a couple of other stock hens of any breed, and note taken of the fertility and hatchability of the eggs, and the growth, etc., of the chickens. About the same time, or earlier (in 1941), the second lots of bought eggs—from strains C and D—will be incubated; and in due course the pullets from them will be started on the trapping test in October, 1941, but the cockerels from these strains (C and D) will be required for the first breeding pens set up. Hence, the earlier in the year that the C and D eggs are set, the better chance there will be of these young male birds becoming furnished for the purpose; and they will have to start their fertility, etc., test with the hens to form the laying strain. They will be mated with the young hens A and B—the pullets which have been trapped during their first year of laying and have moulted through. Therefore, in December (1941) or January, whenever the breeding pens are made up that winter, four pens can be mated by running cockerels C with hens A and B, and cockerels D with other hens A and B, thus forming matings CA, CB, DA, and DB. It may here be remarked that in each union throughout, as indeed in the cross-breeding of poultry, the first letter or name denotes the male line. In addition to these four pens, mate the second-season cocks A and B with hens B and A (of the same age) and thus create

AB and BA pens, and bring the total up to six matings for the winter of 1941–42.

Checking Up

In the hatching season of 1942, January to March —or even later, according to the breed which is being pedigreed—eggs from the six matings will be incubated, while in October of that year the pullets among the 1942 chickens will be put into their trap-nest quarters—or, rather, the trap-nests put into the house or houses the pullets are occupying, so as to prevent unduly disturbing them when they are about at the laying stage. At this time of the year, too, the trapping of the young hens C and D will have finished for their first season, and these birds will be moulted —ready for the stock pens. It will be as well to check up here. At the end of 1942 there can be on hand A and B hens (hatched in 1940) which have finished their second season of laying and their first breeding season—commencing to lay in the autumn or winter of 1940, they began their first breeding season in the winter of 1941–42. There can also be A and B cocks which have finished their first full breeding season (as second year cocks); young hens C and D, which have finished their first season of trapping; and young C and D cocks at the end of their first breeding season. In the winter of 1942–43, therefore, mate up cocks A and B (rising three years) with hens C and D to produce chickens to form four more pens, viz. AC, AD, BC, and BD; also, mate C and D cocks with D and C hens, for CD and DC, which, with the original, can bring the total to twelve.

There will also be available for the breeding pens at this time cockerels of AB, BA, CA, CB, DA, and DB matings—which were hatched during January to March, 1942—the pullets of these unions having just been started on their trapping test. Hence, if sufficient of the 1940 and 1941 hens are on hand, they could be mated with the above cockerels, and thus their progeny would be ABC, ABD, BAC, BAD, CAB, CAD, CBA, CBD, DAB, DAC, DBA, and DBC. By using the 1942 hatched cockerels, therefore, the three-letter pens would be started; but I think that the breeder will find it more convenient for recording to re-mark any such chickens with other and single letters, taking them in alphabetical order in both cases, as these additions can easily be noted in the stud book. Thus, for instance, chickens from the AB with C mating —the ABC birds—could start in life as E, the ABD chickens as G—the letter F is omitted, as it is too apt to be confused with E—and so on. Should any of the double-letter cockerels be unsuitable they would certainly not be mated, but killed for table or sold as ordinary stock birds, unrecorded or recorded, according to their quality. In this case, of course, the alphabetical order would still be adhered to, as, ABC becoming E, BAD would be G, granted there not having been another AB cockerel to mate with D hens, or a BA male to mate with C hens.

In the January to March season of 1943 chickens will be hatched from the latest pens, viz. AC, AD, BC, BD, CD, and DC, as well as from the three-letter ones. About October the trap-nesting of the pullets from them would commence. At that time the young hens (CA, CB, etc.) from the matings of the 1941–42 winter, will have been moulted after being trapped, and be ready for mating. By the end of the year (1943), omitting the three-letter stock, there will be four distinct sets of male lines, viz. A (in AB, AC, and AD), B (BA, BC, and BD), C (CA, CB, and CD), and D (DA, DB, and DC), the three of each initial letter being related through the male line.

For the breeding pens for 1944, therefore, consisting of the stock which was selected for the purpose during the winter of 1943–44, any of the foregoing males (half of which are cocks, and the others cockerels) of one group can be mated with available young hens (which latter will be AB, BA, CA, CB, DA, and DB) but with different initial letters. For example, AC cockerels could be mated with all except AB young hens; BC with all except BA hens. This will create still more pens, such as ACBA, ACDB, BCAB, BCCA, and so forth. In this case, of course, it will be as well to reduce the four letters to one, as mentioned in a preceding paragraph. It entails nothing more than a slight addition to, and not an alteration of, the entry in the stud book; and there will have to be transfers of entries in any case. For his own sake, however, let the recorder see that his entries are kept with strict accuracy.

A Suggested Breeding Table

The following table will let the beginner see at a glance how he should commence and proceed—

1940	
January to March.	Hatch eggs of A and B strains.
September.	Start trap-nesting pullets.
1941	
January to March.	Hatch eggs of C and D strains. Test cockerels (A and B) with other hens.
September.	Start trap-nesting pullets C and D.
November and December.	Young hens A and B ready for mating with C and D cockerels, to make up breeding pens CA, CB, DA, DB; also mate cocks A and B with hens B and A for AB and BA pens.
1942	
January to March.	Hatch chicks from own matings.
September.	Begin trap-nesting pullets from them.
November and December.	Young hens C and D ready for mating with A and B cocks; also mate C cocks with D hens and D cocks with C hens; see note regarding cockerels hatched during January-March, 1942 and hens of 1940 and 1941.

1943	
January to March.	Hatch chicks from above mating.
September.	Start trap-nesting pullets.
November and December.	Young hens (hatched January-March, 1942) ready for mating; see notes regarding pens.

In subsequent years the routine of hatching, selecting, trapping, mating, etc., will be along similar lines to that mentioned above, the breeder being careful to keep the matings as distinct as possible in the manner indicated; and if he does not wish to mate hens with male birds to whom they are closely related, he could out-breed. When making up the pens it tends much to the production of uniform stock to mate in families, to the extent of having full sisters (pullets from the same dam) in one pen; but, let me repeat, such hens must not be the sisters of the male bird with whom they are mated, because that would be the closest form of in-breeding. Those who favour standard type—and many breeders of laying stock find more profit in named breeds than in birds which are "just layers"—will bear that point in mind when they are selecting their birds, and combine it with size, as stock such as this, even if the hens have put up only a moderate record of, say, 180 eggs in their pullet test, will be found decidedly more preferable to undersized hens of poor breed shape which have a much higher score to their credit. However, stamina for production—to ensure low mortality among the adult birds, strong fertility of the eggs, rearability of the progeny, and the production of first-grade eggs—is the essential he must place first when making his selections for his breeding pens; but, let him aim for a uniform mating rather than one consisting of as many different types as there are hens in the pen.

General Management

As regards the age of the males and females to form the pen, although, as I have previously remarked, a fully-furnished cockerel of eight to ten months and a matured cock ten months or more his senior are generally preferred to older males, I should not hesitate to breed from such birds up to five and six years of age. As to the females, I never breed from pullets when laying qualities are the object; at least, not to the extent of trapping the birds for only three months in winter and then mating them in spring according to their records. The specialist breeder should certainly trap and test the pullets through the whole of their first season of production and not mate them until they have moulted through and are again in full vigour. But, as with the cocks, the hens can be kept as stock birds for five to six years, or even longer, provided they are worthy dams. Mistakes made by poultry-keepers who do not thoroughly understand the breeding of fowls are to use only cockerels in their first flush with pullets at the height of their first season of laying, to keep the breeding stock mated for too long a time each year, and to neglect them when once the pens have been disbanded.

Management has a great deal to do with vigour among the breeding stock; good management is particularly essential when layers are being bred. Three months each year should be the maximum period for a stock male to be with the hens, and often it is beneficial to curtail even that time. The hens, however, can be utilized as long as is found necessary, other males being mated with them after the lapse of a week to ten days. When making up the pens it is not absolutely essential to run one male bird with the hens of one strain only, because, as shown in the 1941 matings, for instance, a C cockerel could have A and B hens with him. Some poultrymen carry out the breeding operations by using single hens of each strain, that is, they mate in pairs, a plan they adopt when recording for the male line.

The breeder who is forming his own strain of layers has almost innumerable points to watch, as well as minute details to record; and he who succeeds fully deserves all the pecuniary benefit derived therefrom. Such an achievement is as creditable as, even more so than, that of the fancier who breeds—sometimes for others to exhibit—the splendid specimens which win the championship prizes at the most important shows of the year. To get perfection in laying stock, however, entails much more work, spread over a far longer period, difficult as it is to establish a strain of prize poultry. Only after years of care and patience is the skilled breeder able to stage winners at Laying Trials; and that is the aim of many who breed laying stock, because by such achievements are his birds valued by the public. Nevertheless, there is a much broader aspect than breeding for the highest records at such events; and that is, the breeding of hardy stock whose progeny, in the hands of the specialist egg-farmer, will produce a high average of marketable eggs.

There is plenty of scope for the breeding of layers with that object in view, while to make it a financial success there is really no necessity for one's birds to win at Laying Tests or, in fact, to be entered for competition at them. Anyone who can breed pullets up to the standard required by the specialist egg-farmer will not have far to seek for sales, because the demand for this class of bird is a large and ever-increasing one; and once the commercial farmer can be assured of his supply of reliable pullets, he will be quite prepared to concentrate solely on egg production.

In-breeding and Out-crossing

I have just remarked that the breeder of laying stock who does not wish to mate hens with male birds

to whom they are closely related can out-breed. On these and similar terms used in connexion with the breeding of fowls, the novice will doubtless require enlightenment; hence I shall endeavour to explain them as simply as possible. To in-breed, according to a standard dictionary of the English language, is "to breed in-and-in," or, as mentioned in Webster's International Dictionary, "to breed from animals of the same stock that are closely related." This latter is what is meant by the in-breeding of poultry. For example, inbreeding occurs in the following instances: the mating of (1) a cock or a cockerel with a hen or a pullet, both of whom have been bred from the same dam and sire, and thus are brother and sister; (2) a hen or a pullet with a male bird used in the single-mated pen (i.e. the breeding pen with only one cock or cockerel in it) from which she was produced, therefore, sire and daughter; and (3) a cockerel with the hen from one of whose eggs he was hatched, thus son and mother. These are instances of very close in-breeding.

Of recent years, however, that degree of in-breeding which is carried out by matings (2) and (3) is referred to by some authorities as line-breeding, and one writer has described it as "the systematic mating of parent and offspring to fix certain good points," insisting that "line-breeding is distinct from in-breeding because the latter is the mating of brother and sister." Nevertheless, that form of line-breeding which, obviously, restricts the mating and selecting of the birds to one single line, although it may be systematized, is in-breeding, no matter by what other name it is called; and it is not the method for the beginner to adopt in his endeavours to establish a strain, because he will require some experience before he can use it to advantage.

Out-crossing or out-breeding—they are synonymous terms—is the reverse of in-breeding (breeding from birds of the same stock which are closely related), because with fowls it means the mating together or crossing of birds of two different strains but of the same breed-variety, that is, introducing another line distinct from the existing one, by using in the breeding pen a cock or a hen unrelated to any bird with which he or she is mated. For instance, if I were to mate a White Wyandotte cockerel from another breeder (X)—whose strain was distinct from mine—with one of my White Wyandotte hens, the results of that union would be chickens which were out-bred or out-crossed to X's strain. Out-breeding in its strictest sense refers to the crossing of two fowls of the same colour (or variety) of the one breed; but fanciers, who do not breed specially for high egg production, are said to out-breed, as some of them have out-bred, their strain when they mate together two entirely different colours or varieties of the same breed, as in the case of mating the Blue Orpington with the Black Orpington to intensify the colour and markings of the former. However, that does not concern us here, because we are discussing laying qualities.

Out-breeding is not Cross-breeding

It is as well to note that out-breeding or out-crossing must not be confounded with cross-breeding; at any rate, although to out-cross is, logically, to cross-breed, cross-breeding has a different meaning in a "poultryological" sense. That is, in the ordinary acceptance of the term among poultry specialists, the cross-breeding of fowls is the mating together of (1) two distinct standard breeds, such, for example, as the Indian Game and the Dorking, thus resulting in a first cross known as the Indian Game—Dorking; (2) three or more standard breeds when the mixture is intentional, as in the case of establishing a new breed, of which several examples are given in Chapter IX on the "Breeds of Fowl and their Characteristics"; and (3) two or more colours or varieties of the same breed to produce a new variety, although this is defined as "crossing within the breed," except by fanciers who generally refer to it as out-breeding. On the other hand, the indiscriminate mixing of standard breeds or cross-bred fowls produces mongrels; and such is also the result when a male bird of a standard breed is mated with nondescript hens—a common practice, at one time, with those who kept barndoor fowls, in the hope of improving their laying or table qualities.

It has been asserted by some authorities that line-breeding—which is systematized in-breeding—is the only way in which a strain of fowls can be established, whether that strain be for the fancier from which he can, or hopes to, breed his exhibition specimens, or to enable the breeder of laying stock to get high egg production, "because every time fresh blood is imparted the strain is changed." But, while in one respect the fancier and he who breeds specially for egg production are similar, in that they are pedigree breeders to the extent of breeding their birds in "lines," the former almost invariably breeds to one line only—and thus breeds from birds of the same stock which are closely related—but the latter, if he be wise, will have several lines. That is why, if a start be made in the manner I suggest, he can improve his stock without too close relationship, provided he is careful in his selections. Many breeders of laying stock, those who aim for high egg results, are unwilling to in-breed their birds, not necessarily because they have had any experience with it themselves, but because they have heard that the inevitable result is weakly stock. And yet, those who have practised it,

and are still doing so, are aware that good strains of layers can be produced by means of in-breeding. The skilled breeder, however, knows exactly how far he can go with safety, and does not venture farther.

Experience with in-breeding has taught every careful breeder that, if continued for too many generations, stamina will be impaired; and stamina is the first point he watches. He knows that the pullet is required to use stamina to its full extent in her efforts at high production; therefore, he breeds not only so that she shall maintain that stamina when it is taxed to its utmost, but for the renewal of it after each prolonged spell of effort. The utility poultry-breeder who desires to establish a strain of first-class layers of his own must make up his mind that he will have to in-breed to a certain extent, even though it may be termed line-breeding. But if he studies his matings carefully, and out-breeds when he finds that the lines are getting too close together, there is no reason why he should not eventually succeed in getting his strain of layers.

Breed for Stamina

In-breeding is the only system which can be considered when the question arises of making the best possible use of an outstanding fowl; but do not continue it after the third generation, that is, a cockerel with his daughter and granddaughter or a hen with her son and grandson. During each chicken season, however, keep an eye on stamina, because strong, vigorous chickens are the ones to select. There must be plenty of lines so as to avoid in-breeding except in a few isolated cases; and when a change of blood is found desirable, i.e. the strain, or one line of it, has to be out-crossed, particular care must be exercised in selecting the bird required, whether on the male or on the female side.

It is declared by some authorities that, when egg production is the objective, out-breeding is likely to prove the most successful system to adopt; and one of them has gone so far as to say that "It is the proud boast of thousands of successful breeders that their stock have been out-crossed with so-and-so." Nevertheless, there are not thousands of breeders of laying stock who possess reliable strains; and even to-day, when good stock birds can be obtained, it is imperative that the new blood introduced is good blood. This means that it is essential, when purchasing stock for out-crossing, to get full particulars of its performance for at least the three previous generations of both sires and dams; and since, obviously, the object is to improve some point in which one's own strain is weak, that will be borne in mind. However, if the breeder begins with four strains and selects his birds on the simple lines I have suggested, he will have the satisfaction of keeping his stock free of in-breeding for some years, and of ensuring sturdy birds, provided his foundation stock possesses stamina and that he manages his fowls with this object in view.

That no easy task lies before him in establishing a strain is evident when he realizes that he is breeding not for one point only but for the combination of several points; and although it entails much detailed

FIG. 228. A RHODE ISLAND RED HEN

The hen depicted above holds a record of 505 eggs in twenty-four months, during the whole of which time she was non-broody. She and the Light Sussex pullet, and White Wyandottes previously mentioned, were bred by Messrs. John H. Dowden & Son, of Heathfield

work, it will be worth while if he is keen on the breeding of poultry. After all, the indiscriminate breeding of fowls by the easy method of mating birds together merely because they look good, is of little use except, perhaps, for the production of market chickens; but even table fowl production has much to do with the selection of the right stamp of breeding stock. There is this in favour of careful breeding for laying qualities; birds which are not up to the standard set at the different stages—and progress can only be gradual, as I have shown—can always be utilized in some other way as a means of income, even if they have to be disposed of for table. There are, almost invariably, culls in the best of flocks, as every pedigree-bred bird, whether bred for utility or exhibition, is not 100 per cent perfect. There is, nevertheless, an incentive to breed well when one

starts on establishing a laying strain, because birds which can be depended upon for stamina and good production always meet with a very remunerative sale, and fully compensate the breeder for the expense and trouble to which he has been put in building it up.

Line-breeding

I have said that those who have practised in-breeding, and are still doing so, are aware that good strains of layers can be produced by its means. There are many poultry-keepers who believe that in-breeding of any kind can result only in loss of production and vigour; and this is probably because they have heard that high-producing strains of layers can be established only by the mating together of unrelated stocks, or by out-breeding and introducing new blood on the male or female side at stated intervals. If, however, we differentiate between in-breeding and line-breeding to the extent of saying that the former refers to the mating together of brother and sister and that line-breeding deals solely with the other two unions mentioned under "in-breeding and out-crossing," then a certain amount of line-breeding can be advantageous. I do not suggest that the breeder of laying stock should adopt the elaborate system of pedigree-breeding on the lines of the popular Felch Chart—the work of Mr. I. K. Felch, a veteran poultry judge and breeder of America who had devoted much time and study to demonstrate how three distinct strains can be produced from a single pair of unrelated fowls, yet maintaining the characteristics of the original pair. That chart was intended for the breeding of exhibition birds.

The whole system aims at breeding from individuals of a single line of descent, starting with a pair (male and female) of unrelated fowls, and not so much with the idea of producing better birds as of retaining in the progeny certain characteristics of the originals. Howeyer, since it will serve no useful purpose to explain this complicated method, even with the aid of a chart, it is not worth while doing so, particularly since attempts to carry it through in its entirety have not, so far, resulted in establishing a strain of prolific layers. I certainly advise the beginner to try the less intricate system I have already outlined.

Now as regards line-breeding in connexion with the laying strain which is being formed, this would arise in the case of some particular factor appearing, and which the breeder, obviously, would wish to fix; and the best way of doing so would be to in-breed. For instance, suppose a pullet showed exceptional vigour throughout her first season of trapping, had a good record for size and number of eggs, moulted through quickly, and produced sturdy chickens from her own first mating; it would be advisable to mate her back to her sire, and also use her daughters and granddaughters in like manner, provided the original sire remained in fit condition for breeding. Likewise, I should not hesitate to mate one of her brothers back to his dam, and to continue on similar lines with their produce, at the same time crossing cockerels from the female line with pullets of the male line. I should continue up to the third generation, if possible, with each of these in-bred lines, and then cease, because, while the chickens would be vigorous—and there is no reason to imagine that a bird is less vigorous on account of its having been in-bred to such a small extent—I should consider the factor sufficiently fixed to enable me to breed it into some other line or lines of the strain.

In this method of close breeding, no matter for what factor, everything would naturally depend on the age of the original dam and sire; but if it can be managed then it may be carried out without any fear of deterioration. It is in such cases as these that one has to breed from pullets after the first mating with the sire, and also in the crossing of the progeny, which means that they would have to be trapped for production and bred from in their first season. But it is possible with early spring-hatched pullets which are well grown and not stimulated for early laying. When breeding prize stock some years ago—although I have never exhibited a bird—I was successful at in-breeding with three or four breeds, solely for experimental purposes. It simply meant careful selections, short mating seasons, and hardy rearing by hens; but stamina was maintained, while egg production was up to the normal for those days.

However, breeding for the high records which are now demanded means that stamina must be a very strong factor; hence, when and how far to in-breed his stock are matters which the breeder alone can decide, because he will have to act according to the particulars he has recorded. The beginner, nevertheless, can steer clear of it for some years by careful selections; and he will have enough to do to keep count of the best of the birds he breeds each season by unrelated matings not to attempt in-breeding until he has gained considerable experience. At the same time let me impress upon him the necessity of being especially careful with out-crossing, because it is possible by such means to breed into a strain some defect which may take years to breed out again. The work he undertakes is not the easiest in connexion with poultry; but it is worth while.

Marketing Hatching Eggs

Although this chapter deals with the breeding of fowls for egg production, the man engaging in this branch will have to market much of that which he

produces after he has been going for a season or two. The ordinary channels for table chickens and new-laid eggs are, of course, open to all; but they are not sufficient for the specialist. He will have to work up a trade in eggs for hatching, perhaps day-old chickens, then pullets at the half-grown stage, as well as those ready to lay, and subsequently stock cockerels, tested breeding hens, and possibly mated pens. All of these are within his reach as he proceeds; but he will probably begin with eggs for hatching, although he may be able to work up quite a good local connexion in day-old chickens. However, if he follow the usual lines he will start by disposing of "sittings"; and in this direction much can be done by judicious advertising in journals devoted solely to the practical side of the poultry industry. Promptness in filling orders is essential to enable one to make headway in this branch. Sittings booked in advance must be dispatched at the date specified by the purchaser, while orders received for eggs by return should be promptly attended to and executed by the first available train. When eggs are ordered from a special pen send them from that mating only.

Sittings usually consist of a round dozen of eggs; and it is customary for the breeder to replace infertiles once, provided those eggs which fail to hatch are returned intact to the seller, carriage paid, and they are actually infertile, i.e. clear. However, there is often so much misunderstanding on the part of the purchaser—generally a novice—as to what is meant by an infertile egg, that it saves much trouble and correspondence to let each sitting consist of fifteen eggs, with the stipulation that none shall be replaced. The eggs should be packed in specially sectioned boxes, preferably non-returnable, because while the breeder can obtain those which he can use for several years, the price he is likely to get for the eggs when he is starting in this branch will not cover the expense of such packages, particularly if the buyers forget to return them. Thousands of eggs for hatching have been sent long distances in nothing more elaborate than a wooden sweet-box, lined with hay or dry moss; but there is no excuse for not using special egg boxes, because the cost of them to-day is so small that it can be included in the price charged for the eggs.

Many breeders stamp their eggs with their names and addresses; it is certainly advisable to have each egg so marked that, should any be returned, they can be traced to the hen or pen from which they were collected. Each package should be labelled, "Valuable Eggs. Urgent. Please Handle with Care," and bear the sender's name and address, and, of course, those of the consignee. Packages should be secured by string, the lid not being nailed or screwed down; and pasted labels rather than "tie-ons" should be used. Each egg should be wrapped in a small square of newspaper, with the twist of it on the broad end, and put into the sections small end down; they must be allowed to remain in that position for twenty-four hours at least after arrival, before being put into the incubator or under the hen. It is perhaps hardly necessary for me to add that only sound-shelled eggs should be selected, of good shape, each weighing not less than two ounces, and, of course, clean and new-laid, any over a week old being kept for home use.

Disposing of Day-old Chicks

There is much in the day-old chick trade, since many poultry-keepers have not the facilities for incubation, even by broody hens. Packed in the special cardboard boxes which are available, the birds can travel long distances in perfect safety; and I have had sturdy chicks from places as far away as 300 miles. However, most beginners will probably have supplies for local demands only; but even in this case care is required. The box should be lined with hay, packed well into the corners, so that the birds will be confined to the nest and allowed just enough room to snuggle together on the bottom; and a flannelette covering put over them prior to tying down the lid.

When the chicks have to be sent any distance by rail they should be packed as soon as they are dry, and dispatched by an early morning train and by the quickest route, each box being labelled and securely strung. Chicken boxes are generally sent from the makers with an indication of what they will contain printed in bold type—"Live Chicks with Care." The chief point about packing the birds is to put plenty of hay on the bottom and around the inside of the box, so as to prevent any chance of the chicks getting out of place, because, with the flannelette covering, they will be travelling in what is practically a "fireless" brooder.

Those who purchase day-old chicks should note that when they are brought by carrier, it is not advisable to sign for the birds until the package has been opened and examined, so that if any of them are dead—which, I must admit, very rarely happens—this should be notified on the waybill with one's signature. Otherwise, add the words, "Not examined." The sender should be informed by an early post of the condition of the birds on arrival, so that, if there have been any deaths on the journey, he can make a claim against the carriers, if necessary. On arrival, chicks which are to be brought up artificially should be put immediately into a brooder which has been heated for a day at the required temperature, and left there for three to four hours to settle down. Do not attempt to feed them as soon as they are taken

out of their travelling box. If the intention is to rear them naturally, keep the chicks in their box in a warm room until the evening, when they can be gently placed under the hens. If they are sturdy birds they will cause no more trouble than the best of those hatched on the premises, no matter whether put into ground hovers or wire floor brooders, or entrusted to a reliable broody hen.

As to the other ways in which the breeder can dispose of his produce there is generally a good demand for growers, pullets from the off-brooder stage to the age of four months; but the breeder who is establishing his own strain will need to be well advanced before he is likely to have such birds for disposal, just as it will be some time before he is in a position to run sufficient pens for supplying egg-farmers with ready-to-lay pullets in any quantity. It may be, though, that he will have a few surplus cockerels which have been too good to kill for market, although scarcely up to what he requires for his own breeding pens. Such birds can frequently be disposed of to poultry-keepers for first crossing, that is, running with a different breed of hen. Breeding hens which have been tested for their pullet produce, but have failed in some factors which the breeder is endeavouring to fix or improve, may also be available; and birds such as these, with an unrelated cockerel, are often in request as breeding pens by small poultry-keepers. This, of course, is looking ahead; but unless the breeder is always prepared to make the most of the birds he does not require for his own use, instead of marketing them simply as "killers," he is not likely to benefit to the extent he would do otherwise. There is no reason why the establishing of a laying strain should be a period of all outgoings, and no income from the birds.

FIG. 229. PEDIGREE PULLETS

White Leghorn and Light Sussex pullets, specially bred for egg production. Snaps at the Southern Laying Test

Selecting Pullets for Laying Tests

Among poultry-keepers who specialize in the breeding of fowls for egg production, there are those whose chief endeavour is to develop their stocks to such a high degree of efficiency that pullets bred from them shall be fit to compete successfully at one or more of the numerous Laying Tests which are now held in this country. Whether these Tests have been the means of lowering the stamina of layers and thus increasing susceptibility to disease among such birds, as some authorities state, is a subject which cannot be discussed here. They are to the utility breeder to-day what the poultry show has been to the fancier of standard-bred stock for a great number of years. So, as extreme utility specialists have insisted that the fancier has ruined many breeds by his fads, can it be that the endeavour for eggs, eggs, and still more eggs, is proving detrimental to laying stock? I hope not. At any rate, it may be said in favour of Laying Tests that they have certainly been an incentive to the production of pullets which lay a much greater quantity of eggs during their first season than is usual in the average poultry-keeper's flocks, while they have served a very useful purpose in demonstrating what can be achieved by good feeding and sound management when fowls are carefully bred for egg production.

These results alone have been of very considerable benefit to the poultry industry; and Laying Tests —competitions, or trials, for by such names are they also known—are so firmly established that they will always be well patronized by specialist breeders. In fact, so popular have they become that at the most important of them it is invariably the case each year that more birds are entered than can be accommodated; hence many of those which do compete

at them are lucky in the ballot. At some of these Tests, possibly at all of them, every precaution is taken to prevent diseased stock being penned; and at one which I have attended for several years at checking-in day for the express purpose of handling all the pullets for general characteristics and other points, each bird, after being weighed, is very carefully examined by a well-known poultry pathologist, and is not passed to me for handling unless it is certified as sound.

FIG. 230. SMALL-UNIT HOUSES

Although houses similar to those shown above are in use at some Laying Tests—each accommodates a dozen or more pullets in two sections—they make good night quarters for small-unit breeding pens. When set aside for this latter purpose, however, the fences should have substantial divisions for about 3 ft. up

Now, the selection of the pullets which are to be sent to the most important Tests is no mean task for the very experienced breeder, but the beginner will not be so unwise as to attempt anything too ambitious, and he should commence by entering his birds, if possible, at his own County Test. For such a purpose as this, nevertheless, he will have to exercise great care, because upon the results of his selection, reflected in the pullets' performance at the Test, will the value of the whole of his stock be assessed by the public —the one pen of fowls, four to six as the case may be, will be presumed as representing his flock. If, therefore, he decides that his own recording sheets are such that his strain might well be tried out at a public Test, by all means let him enter his birds. Obviously he will select the eggs from his best pen, and only from hens which have a perfectly clean bill of health, because stamina must be the first consideration—the pullets which have to compete must have stamina to ensure their remaining in production throughout the whole period of the Test, and without moulting or even neck-moulting. The breeder can rest assured that while the pullets are on the Test ground they will be correctly fed; but unless they have inherited stamina they will not be equal to the tax of heavy production.

Weight of egg is also important; but this will depend upon the line from which the bird has been bred, combined with the result of her handling. On this matter, which coincides with the date of the pullet commencing to lay, there are diverse opinions. Some authorities suggest that all pullets for the Laying Tests should be hatched not later than February, since in the ordinary course of events they would

commence laying towards the end of summer and could then be tested at home, by trap-nesting and recording prior to their going to the Test. The idea behind this suggestion is that the owner would then be able to ascertain not only which pullets begin with 1½ oz. eggs, but those whose eggs gradually increase in weight to produce the desired 2 oz. egg by the second month of the Test. This would be eminently satisfactory—if the Test were being held at home.

Such an arrangement would enable one to subject the birds to a preliminary training to the trap-nests, while if they could be given a similar diet to that which they would get at the Test it would be ideal. But, while this latter can sometimes be managed—by a perusal of particulars which are published in connexion with some of the Tests—there is one very great drawback to it, and that is, changing pullets to an entirely different locality, and subjecting them to strangers, when they have just started to lay or have been laying for a few weeks, is very apt to interfere considerably with production and send them into a moult. It is preferable that the birds should not have laid even a few eggs before they go to the Test ground; and I should not like to risk it even though the Test were being held in my own locality. It would be entirely different if the Test did not commence until spring; but all Tests start for winter production.

After the birds arrive they are allowed a certain number of days in which to settle down to their fresh quarters before trapping commences; and it will generally be found that those which have been laying for some weeks prior to arrival will probably continue to lay for only a very brief period and then fall into moult. I was discussing this point quite recently with an official connected with one of the most important Laying Tests in the south of England, and he assured me that pullets which had not started to lay or been trained to trap-nesting generally got accustomed to the change of quarters and management much quicker than the others; and, moreover, they settled down to steady production without moulting. This I also know from experience, because while I have never entered birds for competition at a Laying Test, I have frequently given advice concerning such pullets and have had it confirmed by results. It must be admitted that moulting is a serious matter with birds which enter the Tests, because if even one in a pen should go into moult at the beginning or towards the end, or even drop into a neck-moult in spring, it would naturally reduce the total of eggs produced. It is because of the fear that pullets which have commenced to lay prior to arrival will moult during the same winter, that I advise amateurs to keep such birds at home; a change of quarters and an alteration of the diet are better before the birds come into lay than when they have been laying for only a short time in autumn.

Examining the Pullets

Pullets which are selected for the Test should be hatched in March or April; and at no stage should they be stimulated to commence laying at an unduly early age. If it were possible to ensure the birds starting their career on the day that recording began on the Test ground, it would be perfect from all points of view; but this cannot be done, because no matter how carefully they have been bred, they are not machines capable of being timed to the second. It is one of the risks which have to be run; but I should rather risk it with pullets within a few weeks of laying than those which have been in lay for some time, because the latter are very liable to moult on removal to the Test ground. Egg weight, therefore, and productiveness also—this latter generally referred to as "high fecundity"—depend largely upon ancestry.

A careful examination of each pullet for general body size and capacity should be undertaken when making the final selection for egg weight; and such details as are given on this matter in Chapter IV will be found of valuable assistance. It will be understood, of course, that a pullet which has not come into lay cannot possibly have the pelvic measurements or the abdominal capacity of one in full production; but a well-developed bird of five to six months of age, the daughter of a hen and a cockerel which have inherited that factor, should stand an excellent chance of keeping up the family tradition in this respect. She should have a shapely body, with width across her back; and although her pelvic arch will not be open if she has not laid, those bones should be fine, and her keel-bone well dropped at the rear, as she will be near the laying stage and be feeding well.

Productiveness, like egg weight—the latter, of course, referring to size of egg—is, as I say, largely a matter of ancestry; it must be bred in, and the most prolific pullets are hatched from dams descended from long lines of steady producers, which are mated with cockerels from big egg-laying dams. It is not sufficient to select from one generation of heavy laying only, because to fix this factor—or, indeed, almost any characteristic—in fowls is the result of selection through several generations. A pullet bred from a hen which put up a score far in excess of the average good production of that hen's sisters or ancestors is not so likely to prove as prolific a layer as one whose dam is from a line of steady producers. However, the untried pullet, on being handled, although narrow between her pelvic bones, should have plenty of room between the points of those bones and the end of her keel, while the skin and the flesh there, as well as the

cloaca, should be soft and pliable, and her comb, wattles, and face bright, smooth, and silky.

And just one more item in connexion with the selection of the pullets for the Test. As those who are familiar with what I have written on the subject of poultry are aware—and I have written much these many years—I consider breed type among utility stock, and particularly layers, of some importance; and that it is becoming recognized is very evident from the fact that at many Laying Tests nowadays awards are offered for breed type—purity of breed and closeness to established standards are worth much when combined with high production. And, after all, standard weights can act as a guide when sizing up the pullets which are being selected. However, let the breeder put type as his last consideration when choosing the birds; but get it in, if possible. And even though only four pullets may be required to represent his flock, he should have at least a score of them from which to make his final selections, and more than that number if he can manage to do so. It is perhaps difficult to form a good pen from a small flock of pullets; but more than one breeder in a small way has won championship awards at Laying Tests.

CHAPTER XIII

THE EXHIBITION SIDE OF POULTRY-KEEPING

BROADLY speaking, the term "Exhibition Poultry" means birds classified as poultry (fowls, ducks, geese, and turkeys) which are displayed at a public show. Some poultry specialists insist that it is understood to be applicable solely to pure races which are bred to a definite standard and capable of producing progeny also conforming to such a standard. Thus, exhibition poultry are standard-bred birds; and since, in the case of British stock, they have to conform to the "Standard of Perfection" issued by the Poultry Club, they are exhibited only for external characteristics, such as size and type of body, colour and markings of plumage, and so forth, all of these show-points being defined in the standard by which the birds are judged in competition. The poultry exhibition, however, may be said to take the broadest view, because at many such events, and especially when they are held in connexion with the annual meetings of the general and county agricultural societies, not only poultry but poultry produce is catered for, and thus provision is generally made for displays of dead (as well as live) stock and eggs, while the live birds are frequently divided into "exhibition" and "utility."

Now, while exhibits which are shown dead, as table poultry, are probably not bred to the standard in vogue for exhibition birds—even when they have to be entered in classes for definitely named breeds—they, like eggs, are graded to a standard and are also judged according to that standard. In many cases, as I have remarked, live poultry—fowls only, as distinct from ducks, geese, and turkeys—are catered for in two distinct sections, viz. "exhibition" and "utility"; but although in both of them the exhibits are pure-bred stock (unless otherwise specified as cross-bred for laying or table), the former is understood to refer solely to birds which are shown by fanciers, and are, therefore, termed "exhibition poultry."

The Importance of Breed Type in Egg Production Stocks

From time immemorial the Fancy has had a strong following among British poultry-keepers, and for many years the exhibition or fanciers' ideal held sway. Long before my days, exhibition poultry were bred for purity of race and conformity to a definite standard; and those were the aims of the experienced fanciers and judges who, in 1865, formed the first standard in the world for show-birds, "The Standard of Excellence in Exhibition Poultry authorized by The Poultry Club" and issued "for the use of the members of the Poultry Club." Such, also, are the aims of poultry fanciers to-day, who breed their birds for beauty of external characteristics.

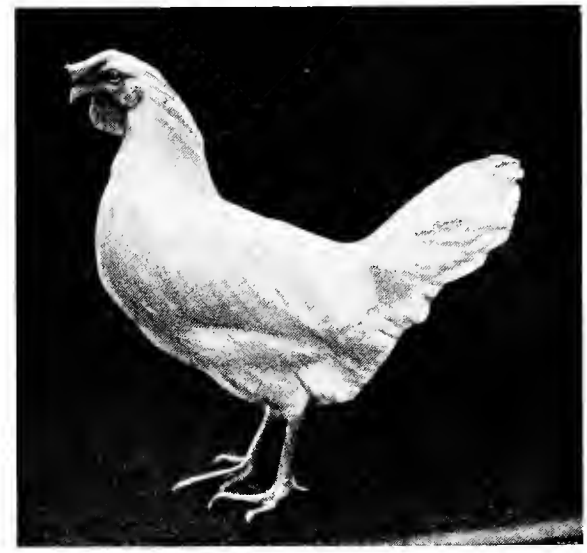


FIG. 231. THE FINISHED ARTICLE

A White Leghorn pullet, utility type, in perfect condition for the show. This bird won several first prizes in keen competition

True, in those early years, as for decades subsequently, some poultry-breeders were opposed to the ideals of breeding which the Poultry Club Standard represented, on the ground that definitions in them did nothing to encourage the breeding of poultry in respect of food production. Nevertheless, while that Standard exists to-day, some of it in its original form, it is becoming very evident that breed type—for which the Standard was set up in 1865—is now being considered of great importance among utility or food-producing stock, if merely because, as a well-known and successful breeder of laying strains recently stated, "from an advertising aspect, it is valuable to send representative birds, true to type, to any place (such as a Laying Test ground) where they can be seen by the public." Moreover, Laying Test officials are insisting upon specimens typical of their breed being sent to the tests, while suggested weights for the various breeds are also stated; and breeders are

being encouraged to comply with these requests by the inclusion in the awards' lists of prizes for birds conforming to breed type. Then, too, at poultry shows, classes are provided for "copper ring hens" —hens which have been officially recorded at Laying Tests as having produced not less than a stated number of first-grade eggs—and the birds are judged according to their standard breed type.

For many years it was considered that a combination of show-pen beauty with practical utility could never be attained in any breed, because it was undoubtedly the case that the fancier—he who bred exhibition poultry—was always striving after standard improvements irrespective of economic qualities, with the inevitable result that eventually the purely exhibition ideal was evolved. It is, therefore, an advance in the direction of combining utility with beauty now that the breed type, which the fancier has recognized for so long as the best means of differentiating between the pure races of poultry, is being acknowledged as correct by breeders of laying stock.

I have always been a strong advocate of conformation to standard type as being the first and foremost essential in genuine utility specimens which have distinctive breed names, no matter whether the birds be for egg production or selected for table production. It is the method I adopt when judging such stock, while one of my first duties on being elected as honorary secretary of the Utility Poultry Judges Registration Board was to draw up rules to that effect. Breed type is, therefore, one of the first points in connexion with the exhibiting of fowls which the amateur poultry-keeper should endeavour to understand; and not only when he is contemplating becoming an exhibitor, but in other branches, because, as already stated, birds which are true to type are good publicity—and publicity of that kind is profitable.

Combining Beauty with Utility

Type will probably not be the first consideration when the breeder is endeavouring to form a laying strain, and it will have to give way to other essentials, at any rate until such a strain has been advanced considerably; but it should not be entirely overlooked. The importance of type in table fowl production is also becoming evident among breeders of such stock, because the breed and the type of bird have much to do with the production of Grade A chickens. This can be understood, now that the food production side of the poultry industry has become standardized as rigidly by the Ministry of Agriculture as the Fancy was standardized by experienced breeders so many years ago. And it is well that it should be so, because not every breed which is classified in the exhibition standard as belonging to the general-purpose group —detailed in Chapter IX—is suitable for the production of the highest grade of market chicken.

In this direction it may be advisable for me to remark again that, as some readers may not be aware, there is no such breed as the "Surrey" which figures so prominently in the London table poultry markets; and the only standard breed of the county of Surrey is the five-toed Dorking. However, there was at one time a four-toed Surrey breed of fowl which, although it was never standardized for exhibition in the Fancy, was bred and sold to a very definite standard; and it is to this standard that the "Surreys" of the markets still conform—those prime table chickens sent to London by expert fatteners are "true to type."

There is not the least doubt that the trend to-day among specialist breeders, who are not fanciers only, is to combine "beauty with utility"; and although it may be questioned by some extremists whether the word "utility" can justifiably be used in connexion with exhibition poultry, it is obvious that the present movement derives stimulus from the influence of utility or commercial production. Nevertheless, despite the contention of the old school of fancier that a combination of show pen beauty with practical utility could never be attained in any breed, I saw the possibilities of it soon after I took up the breeding of fowls—and also of such a combination not only in the same breed but in the same strain. My start was made many years ago when the late Harrison Weir, one of the greatest poultry authorities and fanciers of his day, presented me with a pen of Golden Spangled Hamburghs. Those birds, which were pedigree-bred for several generations for exhibition requirements, produced some excellent specimens for show purpose, while pullets I selected from them proved to be very good layers, and quite equal to laying strains of those days.

Since then, I have carried out similar experiments with numerous other breeds and varieties, among them being Anconas, Bresse, Leghorns, and Minorcas for egg production, and Barnevelders, Old English Game, Orpingtons (including the Diamond Jubilee and Spangled varieties, long since defunct), Plymouth Rocks, Rhode Island Reds, Sussex, Welsummers, and Wyandottes for table and general purposes; and the results have been satisfactory. All of those breeds were reared by me from fancy and exhibition stock only, even the Welsummers; and while I was careful to select and breed the birds to standard to produce specimens fit to show—although never once having exhibited a fowl—they convinced me that such a course is decidedly preferable for the novice than attempting to breed poultry merely for ultra perfec-

tion of external characteristics, fascinating as this undoubtedly is to the fancier who desires show birds pure and simple without due attention being paid to usefulness. Indeed, it is only by this combination that thoroughly sound stocks of pure breeds can be maintained; and thus, standard-bred utility fowls are those for which the beginner should strive, especially if he be in the least interested in exhibiting his birds. It must not be thought that, by making this statement, I would in the least disparage the splendid work which fanciers have done; and since, when all is considered, the Fancy is just a hobby—as rarely can it be run on a commercial basis—it must be admitted that those who breed birds for external points have rendered, and are rendering, valuable assistance to the poultry industry.

What Fanciers Have Accomplished

The spoliation of breeds is a term which has frequently been used in connexion with fanciers and their methods. Some people seem to imagine that the breeding of poultry to the "Standard of Perfection" must necessarily impair the useful properties of a breed; but this is a mistake in the majority of cases, and the exceptions are only when the colour and intricate markings of the plumage, the profuseness of the feathering, and so forth, which are aimed at are hardly favourable to utility, in which case the bird may become less useful. However, while some breeds have gone out of favour, then assuredly has the fancier utilized them to produce new races; so that to-day there is a much wider range of truly useful and profitable varieties of poultry than existed when, half a century or more ago, Polish and Spanish fowls were so popular as layers. In these days, moreover, when the utility properties of poultry are recognized as being of considerable value, changes of type and properties of fowls are not so easily effected by fanciers as happened when the purely exhibition ideal held sway.

The fact that the Standard is being revised to include indications of productiveness, and that classes which are provided at shows for utility breeds are invariably much better patronized by exhibitors than those for fanciers' stock, is proof of this. The Fancy will continue as long as standard breeds exist; but since utility is now on a very strong footing, it is a wise policy for the prospective fancier to keep his birds to modern requirements. That is why, in my opinion, *beauty and utility* is the ideal aim for those who exhibit poultry. And it should be an encouragement to beginners who have the fancier's instinct, because a much wider latitude regarding standard requirements is allowed in "utility" than in "exhibition" classes.

One thing the novice should not overlook in considering standard-bred stock is that the cost of feeding such birds need not exceed that of the average layer, and that many a first-class show specimen has been bred and reared in urban and suburban runs, while amateur poultry-keepers who have no other accommodation might well take up bantams.

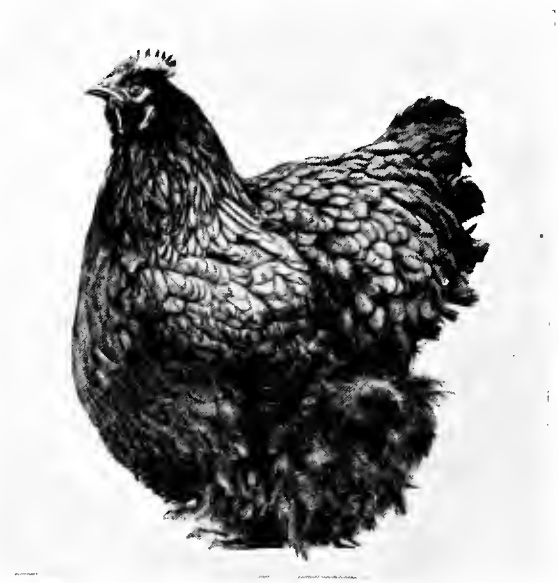


FIG. 232. A BLACK ORPINGTON HEN—MODERN EXHIBITION TYPE

A fine example of the ultra modern type of Orpington, showing the extent to which the Black variety has been bred for profuseness of feathering. The hen portrayed above won more than one championship prize

The Fancy for Bantams

It is generally considered that bantams belong solely to the fancy breeds of poultry and that they are of little use from a commercial point of view, their small size and the diminutiveness of their eggs prohibiting them from attaining any other place in the animal world than that of a highly interesting, ornamental race of fancy fowls. It cannot be said that they are kept to any great extent simply for laying or for table bird production, although they are favoured for such purposes by people who are satisfied with eggs which are seldom as big as graded pullet eggs, and with very small and plump birds for table, as for instance surplus Old English and Indian Game cockerels. And there is one point in their favour; while they thoroughly enjoy unlimited freedom, especially bantams of the two breeds I have just mentioned, they can be kept in healthy and vigorous condition in a small and enclosed run in a back garden, as well as on the strictly intensive system. Several of the best bantams I have judged at shows, as well

as some of those which have gained championship prizes at the most important exhibitions of the season, have never been on grassland, being bred and reared in the vicinity of city or town. They can assuredly thrive in quarters which would be quite inadequate for the big races of fowl, although they require proper attention and good management.

There are many different kinds from which to select, because most of the breeds described in Chapter IX have their miniatures, even such large and heavy fowls as Brahmas, Dorkings, and Indian Game—some dozen or so of this last-named breed are allowed free range of our farm at present, and they agree amicably with the few Mammoth Bronze turkeys and Chinese geese with which they share the pasture. There are also special breeds of bantams, such as Belgians (of four distinct classes, Anvers, Uccle, Grubbe, and Everberg), Booted, Japanese, Rosecomb (almost like Hamburghs), and Sebright, as well as Burmese and Nankin, although these latter two are seldom seen nowadays.

Obviously, bantams do not cost as much to keep as laying pullets, but, of course, they do not return as much in number and weight of eggs. However, many of the more recently introduced breeds, such as Sussex, Wyandottes, Welsummers, and Leghorns, are quite good layers, and while their eggs are small they are of delicious flavour. I would not suggest the keeping of bantams for commercial purposes, but simply as a most fascinating hobby. For as far back as I can recollect, there have always been poultry-breeders who fancied bantams, and some who specialized in them; but during the past three or four years the bantam Fancy has developed to remarkable proportions. At many poultry shows to-day an extended classification is put on for the miniatures, so that the beginner need have no fear that, if he breed good birds, he will lack an opportunity of exhibiting them.

He should not experience the least difficulty in making a start, because whether he fancies the hard-feathered (Game) breeds or the soft-feathered (non-Game, or Variety bantams as these latter are called) he can scarcely fail to find one to suit him. He will be wise to commence with a breed which is well established and which does not require much trouble to prepare for the show pen; and he might select Indian or Old English Game, which are particularly hardy. On the other hand, any one of the more recently introduced kinds, like Wyandottes, Rhode Island Reds, Welsummers, or Sussex might appeal to him, because they are generally better layers than those first mentioned. At the same time I advise him not to attempt to begin with bantams which have any special features such as white lobes or feathered legs, if his intention be to exhibit them; he will have to be well versed in show matters before he can hope to succeed with breeds which require special preparation.

It would be a mistake, however, to imagine that the breeding of specimens suitable for showing is the easiest of matters, because bantams must be as carefully selected and mated as most of the large breeds of which they are miniatures. Haphazard mating will not produce satisfactory results; neither will lack of attention to details bring success. Nevertheless, bantam keeping is well within the scope of the novice who has not sufficient accommodation for poultry; and as one who has kept and bred different races of bantams off and on from schoolboy days, I can assure him that it is a most interesting hobby, particularly if good stock is obtained at the beginning.

Making a Start

However, to return to large fowls. The poultry-breeder who is keeping pure-bred laying stock and has a leaning towards the exhibition side generally experiences more or less difficulty in making a start. Either he does not know whether the birds he possesses are of good enough quality for him to exhibit with a reasonable chance of their catching the judge's eye to the extent of being awarded a prize card, however small, or he lacks the knowledge of showing them to the best advantage. He will naturally not attempt to commence with the purely exhibition ideal but will begin in the utility section, because the provision of such classes at shows of recent years has done much to encourage the exhibiting of laying stocks which are bred to standard.

On the other hand, if it should happen that he does not keep pure-bred fowls but anticipates doing so with the object of showing some of their progeny—he will scarcely go to the extent of purchasing actual prize-winners at the commencement of his career as an exhibitor—he cannot do better than consult a specialist of the variety he wishes to keep, and follow that specialist's advice in the selection of the birds. This will not be a difficult matter if he join the Poultry Club through its county branch, or a local poultry society affiliated to that club. In most parts of the country such clubs exist, and a letter of inquiry to the General Secretary (Mr. C. Grange, Chedburgh, Bury St. Edmunds, Suffolk) will furnish him with full particulars of the nearest branch.

In any case, whether the beginner possesses suitable stock or not, he will find that membership of such a club is very beneficial to him, not only in bringing him into touch with others who are keenly interested in the subject, but in enabling him to gain some useful hints concerning poultry-keeping. Many of these county branches have among their members experi-

enced fanciers and exhibitors who will do all in their power to assist promising novices. This, then, should be his first move, to become a member of a local poultry club.

If it be impossible for him to get advice in such a way then he should write direct to some exhibitor of repute, and state his requirements and about the price he is prepared to give for the birds; and, granted a deal is done, he can rest assured of receiving full value for his money in the shape of suitable stock. When this course is straightforwardly pursued it will turn out satisfactorily. I am afraid that some beginners, after reading up a list of points in a breed standard, expect to be able to purchase the perfect specimen, true to general characteristics and colour, for a few pence more than they would pay for a cross-bred old hen at a country sale. But if more confidence were placed in specialist breeders who exhibit their stock, and the ignorant honestly confessed their ignorance —and instead of pretending to expect perfection would ask for full particulars of birds at certain prices, their merits and their imperfections—much disappointment would be obviated.

The Value of the Show

Every utility poultry-keeper should study the breed points of the birds he intends to exhibit; and he should not be above visiting a purely Fancy show to pick up information. One difficulty he will find when starting will be to assess the show value of his stock; and even though he may have studied the standard until he might be supposed to know the relative value of each particular point by heart, it is quite impossible for him to form an accurate idea of the bird's chance in the show pen until it is compared with other specimens of the same breed. For this reason, the amateur exhibitor will find it an excellent plan, when he imagines he has a good bird, to enter it for competition at a show at which there are likely to be some equally good or even better specimens penned. He should also visit the show in person, when the judging is over, and compare his choice with each bird which may be placed over it; and if the judge happen to be present, it would be as well to get that expert's candid opinion about it. Judges are sometimes available after luncheon; and a judge can tell the beginner more about a bird's defects in five minutes than the latter would probably have discovered in as many months. On several occasions, and particularly when I have been judging at some small show, I have been of assistance to novices in these matters.

Conditions governing the showing of birds in the utility classes have changed greatly since the first utility show was held in this country nearly twenty years ago, and at which I officiated as judge. When such exhibitions were in their early days, the vast majority of the birds which were entered at them were by no means standard bred. Breed type in fact was almost entirely ignored, the fowls being selected by the judges solely for their laying qualities, with the result that undersized and frequently cross-bred

FIG. 233. THE JUDGE
The author making notes while judging poultry (bottom tier) at one of the Crystal Palace Shows

birds were bred for the purpose. Gradually, however, there has been an increased interest taken in the breed standard, so that to-day an exhibition of utility poultry is mainly composed of specimens which can not only put up reasonable laying records, but which are representative of their breed and can be considered as good breeding stock. Up-to-date breeders of utility stock know the benefit of studying the general characteristics of the standard; they wisely realize that type and size, and colour also, have their place in the scheme of things when the public—who are the buyers—inspect the birds. I must admit that, since it is possible to combine standard type with good laying qualities in many breeds, the well-bred

layer is as pleasing to look upon from a judge's point of view as is a purely exhibition bird which is fit to win a championship prize.

It is this dividing of the poultry shows into two sections which is so beneficial for the beginner because it enables him to exhibit the stock which is being kept by him for usefulness. Doubtless, when he is no longer a novice at showing fowls he will try his hand at the other section and become a fancier; but until he has gained much experience, he will be well advised to enter his birds in the utility classes. There will be plenty of opportunities for him to do so at most seasons. A feature is generally made of the poultry section at the agricultural shows which are held in summer and autumn; and provision is now made at them for utility stock in specified breed classes, and not, as they used to be, for "the likeliest layer" but for egg producers of standard breeds. This has undoubtedly been brought about because poultry-keeping is to-day of more than passing interest to the general farmer; and where the classification is suitable for the present-day requirements of breeders, and modern and popular breeds are catered for, the poultry tent is invariably crowded all day long, and "the farming element" is well in evidence among the visitors, keenness being taken in the inspection of the prize winners.

At many of these summer events, too, classes are provided for chickens of the current year, and these encourage early hatching. It has always been my contention that the provision of such classes is highly advantageous to the poultry industry as a whole, since the earlier in the season the breeder begins hatching his chickens, the more likelihood is there of a plentiful supply of cockerels being ready for the first spring markets, and sufficient time to allow the pullets to furnish up naturally for autumn and winter egg production. There is not the least doubt that the show can be of great value to the poultry industry by stimulating the breeding of standard stocks—which should be the very foundation of the industry—and by acting as the shop window of those who breed such birds. This latter is what the exhibitor must always bear in mind; let him take care to dress the window in an attractive manner—to show his birds in such a way that they shall be not only a credit to him but publicity for the stock he breeds.

Beginning in the Fancy

As I have already stated, poultry shows are generally divided into two sections, viz. exhibition and utility. At any rate, it is so with fowls, because those who show ducks, geese, and turkeys are content to do so without any division. Those who breed and show exhibition fowls are known as fanciers or exhibitors, and they form the Fancy; the others are known as utilitarians, although they are, logically, fanciers and exhibitors. However, I shall deal first with exhibition birds.

Full details of the standard requirements for the different breeds and varieties are given in Chapter IX, which also contains particulars of the percentages of points allowed for the several parts of the bird. In all standard breeds there are tabulated "serious defects" for which the specimens shall be passed, that is, not judged; and they include bodily deformities (such as roach back, crooked toes, squirrel tail, wry tail) as well as glaring faults of comb, colour, and so forth. For instance, although 10 per cent is allowed for the head piece of the Brahma, which must have a triple or pea comb, not only 10 per cent would be deducted if a Brahma were exhibited with a single comb, but the bird would be passed. Likewise, a four-toed Dorking would be passed, because the breed is a five-toed one, i.e. it has five toes on each foot. Then, again, in some breeds, side sprigs on a single comb are classed as serious defects, although in my opinion they are not serious unless they give such a comb the appearance of being cupped instead of single. But since the defects vary according to the breed, the young fancier cannot do better than study them in "The Poultry Club Standard of Perfection," a copy of which book (illustrated) can be obtained from the General Secretary of the club.

In making a start in breeding and exhibiting it may well be said that luck plays a prominent part, although I am afraid I do not put much trust in luck at my age. However, I have heard of scores of cases in which amateurs have made excellent beginnings in ways which, to the old hand, would be considered unorthodox. I recall an instance not many years ago of a fancier acquaintance who was very successful with White Leghorns; and until I happened to notice his name as the owner of a winning pullet at an autumn show, I was not aware that he had gone in for poultry. It appears, however, that he had bought half a dozen young hens during the previous winter from a poultry-keeper in the neighbourhood—to keep the house in new-laid eggs, as he told me, although in that matter they were somewhat disappointing—and had mated them with a cockerel he "picked up" at a sale; and the whole lot had cost him two guineas, half of which he paid for the male bird, which at the time he considered to be a big price. From the chickens he reared, half a dozen had won prizes at several shows during the summer and autumn; and he finished up his first season as a poultry fancier with quite a nice list of prizes to his credit. It was just a hobby with him; but he had an eye for a dog, which probably had something to

do with his success. In any case, that might well be described as a large slice of luck, because ninety-nine times out of a hundred one might confidently prophesy failure from such a commencement.

However, instances of this kind serve to encourage budding fanciers to persevere in the hope of similar luck coming their way some day. They also prove that the specialist has a very difficult task in advising beginners how to make a start to the best advantage. Certainly I would not suggest that an amateur should purchase his breeding stock in such a way; neither would I feel justified in advising a complete novice to invest a large sum of money in obtaining suitable birds. In my opinion it pays best in the long run to act cautiously in such matters, and to commence with a small breeding pen of a black or a white variety which has been chosen by a reputable breeder and is likely to produce some chickens which are good enough to be exhibited at small shows; or to buy hatching eggs from such a fancier.

Start with Small Shows

The beginner must not aim too high at the start; it is certainly an excellent idea to have that in mind, but much more sensible to commence at the bottom. Small shows offer the best chance for the novice, because the prize money is generally not high enough to tempt the old hands at exhibiting; and he who fancies winning a challenge cup at one of the most important fixtures of the season at the first attempt is attempting too much. He must be successful at the small events before he tackles the big ones, study the breed he has taken up, and learn how to manage his birds before he handles valuable specimens; and until he has learned what to breed for, it is impossible to produce first-class stock. To be a successful breeder of fanciers' poultry, in practically all varieties of fowls except white and black, one has to understand the intricate points of mating for colour or markings, knowledge which can be gained only from that greatest of teachers—experience. However, the beginner need not be discouraged, because all fanciers who have made a lasting name have had to go through the novice stage.

It is possible, of course, to purchase birds which may reasonably be considered as sure winners; and yet I have seen more than one which has been obtained from a skilled breeder depreciate in value to a very considerable extent within a few weeks in the hands of a novice, even when shown under the same judge. But there may be several reasons to account for this; it may have been at the top of its form when purchased, it may be meeting stronger competition, or, more likely than not, the novice did not exhibit it in the same condition as did its former owner. In any case, it must not be thought that a bird which has once won a prize must necessarily be a winner from that time onwards. Poultry are judged in this country by comparison according to the competition of the day, and they are not pointed by score card; hence it must be evident that a first-prize winner in a small class may very easily fail to get a commended card when shown in a large class and with stronger competition to face. Moreover, at shows held under the authority of the Poultry Club, no prize can be withheld unless the intention to do so is distinctly stated in the schedules issued by the show officials.

In these circumstances, therefore, if a class of two entries were allowed to stand—i.e. not being cancelled for short entries—one bird would have to get first prize and the other second prize, even though both were poor representatives. It could scarcely be otherwise, because it would be practically impossible to fix a maximum number of points which an exhibit should have to score before becoming eligible to win a prize. However, colour and condition of the plumage make a lot of difference to a bird's chance in the show pen; and nearly all breeds may suffer in these respects from exposure. White fowls may develop a cream or distinct yellow tinge, buff birds become bleached, bright coloured specimens fade, and even black plumaged birds lose the brilliance so much desired in exhibition stock, while white lobes may turn yellow or discoloured and the texture of combs become rough. It is hardly possible to keep an exhibition fowl in show condition when it is given its liberty in an exposed run during all kinds of weather; and the amateur who becomes possessed of such a bird must provide proper accommodation for it, if he desires to exhibit it successfully.

On the other hand, however, it is not advisable to keep a fowl in a training pen for several weeks and thereby deprive it of liberty, because, despite what is being achieved with egg-producers confined to single-cage batteries, similar treatment of show stock might result in loss of condition and the perfect bloom desired in an exhibition specimen. The birds need protection from sun during the middle hours of the day, but they must be allowed to take sufficient exercise to keep them healthy. Many fanciers house their show specimens in the small appliances known as cockerel boxes—single roosting compartments with covered runs attached, floorless and movable, and suitable for one bird only—while others build a range of houses and grass runs, partitioned into small compartments, each to accommodate a male bird or a couple of females, sometimes even three or four hens, but never more than one cockerel in each section. When cockerel boxes are in use it is customary to liberate the inmates for an hour or so in the mornings

and evenings; but the range houses are practically scratching houses, generally littered with white sawdust or oat straw, while the grass runs are simply netted over, being in an orchard or near trees for shade.

It must not be thought that the mere washing and cleaning of a fowl is sufficient to fit it for the show pen. Its preparation for exhibition must commence at the period when its plumage is almost completely

FIG. 234. COCKEREL BOXES

Small houses, known as cockerel boxes, in which to keep exhibition birds requiring special attention. They are fitted with single perches and are spacious enough to ensure the inmates being healthy. Portable runs can be attached to them when outdoor exercise is deemed necessary

developed, because at such a time it is in danger of being spoiled through exposure; and the novice fancier will do well to take the work of shading in hand then, instead of waiting until the weather has had a detrimental effect on the feathers.

Breeding and Rearing Fancy Stock

I have said that to be successful with the breeding of other than white and black varieties, the novice has to understand the intricate points connected with the mating of the stock. In some breeds the really important part of breeding is the quality of the female, because while it is possible with them to breed good birds from a bad cock and good hens, it is quite impossible to breed anything good from badly-bred females, however good the male. In such breeds the hens should be chosen with the greatest care, and they must be as nearly perfect as possible, in type, colour, markings, and health, but most essentially in "blood." On the other hand, it is risky to breed from a male which is not well bred. It is seldom advisable to purchase such a bird from a selling class, even if shown by a well-known fancier, because not only may he not have bred it—and have put it in the selling class for that reason—but he is certainly not going to breed from it. Hence the beginner can rest assured that it is not good enough for his own purpose.

It is far better to go to a breeder of repute, state what is wanted and pay his price, than to try to find bargains in selling classes. The only use of selling classes is to enable the buyer to pick up a cheap bird for showing, certainly not for breeding. Always buy from a known breeder of good stock. In other breeds a great deal of importance is attached to the male bird, and in such cases he should be worth at least as much as all the females in the pen put together. Each breed, more, each colour of the breed, requires special mating, and even in the colour known as "black-red" there are so many variations that one mating cannot be adopted for all.

Double Mating

Perhaps one of the greatest deterrents to the beginner is the fact that in many breeds one has to resort to double mating to get the best results. Put into simple language this means that to secure male birds which are likely to be suitable for the demands of the standard, the breeder has to mate differently marked or coloured fowls than is the case when show females are required. Thus do we have the terms "cockerel-breeding pens" and "pullet-breeding pens" —terms which refer exclusively to exhibition stock. It may be that the demands of the standard are too exacting; to some poultry-keepers this standard is too ideal, and aims at that which can but rarely be attained. However, there is this to be said in its favour, that if the ideal were not a high one and difficult of attainment, exhibition fowls might fail to attract; there would be no "honour and glory" attaching to the breeding of a winner, or in possessing such a bird, since anyone who so desired could breed winners.

It must be admitted that there are fanciers who advocate single mating, some of them solely on the ground that double mating is opposed to the natural way of breeding. Possibly it is. It is accepted by most authorities on poultry that the domestic fowl of the present age is descended from the jungle fowl. Nevertheless, there is no conclusive proof as to which variety of that species can claim to be the original ancestor; neither is there sufficient proof to show that Dame Nature resorted to double mating to produce the several gorgeous colours of the male jungle fowl, nor, on the other hand, that the birds did not of their own accord select double mating. It must not be forgotten that there is more than one variety of jungle fowl. The fact remains, however, that in many exhibition varieties of fowl the double mating

system has to be adopted to attain anything like the ideal of the standard.

This holds good even in self-coloured varieties, and, moreover, in those in which head points are a chief consideration. As an example, take the exhibition White Leghorn, in which the male bird's comb has to be carried upright and the female's well drooped. The most likely cock for the purpose of breeding pullets with suitable headgear is one with a large, somewhat thin and falling comb. On the other hand, a suitable hen for the production of good-headed cockerels must have a stiff and almost upright comb. Yet neither of these birds would be tolerated in the show pen. Thus do we find, in most breeds, fanciers who are noted for the excellence of their cockerel strain or for that of their pullet strain; yet seldom does it happen that both appear to perfection in the one.

Another factor which in my opinion militates against the success of many novices is that, too often, they are induced to commence with a breed which requires all the art of the experienced fancier to produce in anything like perfection, and which must be very carefully in-bred. It may be accepted as a fact that all breeds of marking—those in which lacing, spangling, barring, pencilling, and their like are the chief points—are much more difficult to breed to standard requirements than are the self-coloured varieties. Hence, when making his debut in the poultry Fancy; a novice is well advised to take up one of the latter in preference. Certainly, good self-coloured fowls, such as Blacks and Whites, require to be thoroughly understood to be mated and bred with satisfactory results; but they will provide the novice with sufficient to interest him and give him a good grounding for the other and more difficult kinds. Moreover, now that utility is so popular, breeders of certain varieties are reverting to single mating, and some specialist clubs are adjusting their standard to include indications of productiveness. In my opinion the adoption of single mating is inducing more poultry-keepers to take up the exhibition side of the business.

Managing the Growers

Beyond rearing the chickens on common-sense lines and giving them the best runs, no special care need be taken of them. That is, like all other young fowls which are being reared for stock, they do not require coddling; let them rough it, and thus they will grow vigorous. Unless they are of the heavy breeds, both sexes may be left together at first, provided the cockerels do not become troublesome with the pullets; but should this occur then they must be separated. In any case I find it advisable to take the cockerels out of the pen at about three months, but to keep them in full view of the pullets, and in an adjoining run, if possible. It is, however, necessary to keep an eye on them, because cockerels which are bullied never get much of a chance to thrive; so should there be such a one, and he has shown promise of developing some particular point, let him be returned to the pullets, where he can feel safe. On the other hand, it is always beneficial to let any very promising cockerel have command of his run. If undue fighting occur among the young males, then each must have his own run; and this is where the cockerel boxes and small compartment houses are handy—the males cannot interfere with each other but can see the pullets, which has a remarkably good effect on the development of their plumage. When general-purpose or heavy breeds are fancied, the sexes should be separated as early as possible; and from three to six months old the cockerels must be very generously fed, and bone meal or "bone-flour" will be found a beneficial addition to their diet.

In no case should the pullets—whether they be of the light or heavy kind—be encouraged to lay at a youthful age; and the laying stage should be delayed as long as possible, development of body, even in Leghorns, being the most desirable point. Experienced fanciers are well aware that early hatched pullets are apt to start laying at five to six months of age, and that while such birds can generally be checked sufficiently for exhibition at the summer shows, they are rarely of much use for the autumn and winter events, because even if they moult through in time, they are very apt to be passed as over-age birds when exhibited as chickens of the year. In the endeavour to check the laying of such pullets they are frequently moved to fresh quarters; but plain rations and a grain diet will generally be found sufficient to keep them growing in their own quarters. Pullets which are intended to be shown should be kept away from male birds after they are three months old; hence any particular cockerel of a light breed which it is desirable to smarten up might be allowed to run with a couple of hens for a week or more before the date on which he is going to be shown. However, keep the exhibition pullets away from male birds.

The weeding-out of the chickens is always a difficult task; and to the novice one might be almost tempted to say, "Do not weed them out at all." In fact, except for such faults as those mentioned in Chapter VII, I think he will find it most interesting to act on such advice, if he has enough room to rear all the chickens to maturity, because he can then note the changes of colour they go through until they are furnished up, which will be of valuable assistance to him for future broods. But then, again, if he lacks

the necessary space, some will have to be discarded; hence I will attempt to give him a few points for his guidance. Black fowls, as day-old chicks, should be black and white; this is an important point. Many beginners are under the impression that a chick of a black breed should be black when hatched; and yet if it is, and room is required, it should be discarded at once, because it will never be an exhibition bird. The chick which makes its debut in a dress of black and white, and develops a costume with plenty of white in it as it grows, the first chick feathers in its wings being white, will almost invariably furnish with the much-desired beetle-green sheen. The amount of white differs slightly according to the breed; but white there must be for sound adult plumage. Chicks from properly-mated standard-bred black fowls hatch with white in their down, sometimes more white than black.

Then take white chickens. Many novices imagine that, no matter what the breed, the chicks must be absolutely white—as white as driven snow—when they are hatched; and yet chicks from white fowls are seldom pure white as day-olds, but of various shades of yellow, a blue tinge, or even grey, according to their breed. For instance, White Orpingtons generally show a more decided yellow in their down than White Wyandotte chicks, while there is a distinct blue tint in the first feathering of White Bresse. Black-and-white chicks vary; those of the Ancona are generally similar to Black Leghorns, while Houdans have more white than black, but the former furnish up black with white tippings and the latter are black and white mottled. Buff chicks vary from a very pale almost yellow tint to almost a red, while those of the black-red group (such as Brown Leghorns) are of a soft brown colour with a broad stripe of dark brown down the back. The shank colour, too, is deceptive; that of chicks from black-legged fowls is often black and white, from yellow-legged birds willow or dusky, and from white-legged birds with a tinge of yellow. When the chickens are about three to four months old the true colouring generally begins to assert itself; and it is then that the novice should be better able to see which are likely to be the best.

Training the Birds

All fowls which are required for exhibition should go through a preliminary training for about a week; but it need not be the last week before show date. They should, nevertheless, be confined to a show pen at home, to accustom them to being on view and being handled. This training is much more beneficial than beginners are apt to imagine; but I can assure them, as one who has judged thousands of poultry, that it makes a great difference to the bird's chance of getting noticed on show day. This is not because practical judges require any hints on the handling of a bird from the show pen and keeping it more or less quiet while in the hand; but an untrained fowl may do itself considerable injury in its attempts to get away from the judge as soon as he opens the pen door. Moreover, the poor creature is so nervous that

FIG. 235. TRAINING FOR SHOW
Accustoming a fowl to the judging stick

it cannot possibly display its good points to advantage. Admittedly, the beginner in the Fancy will doubtless attend personally to the rearing of his stock; and in this way, by feeding the birds and having few of them to attend to, he should be able to tame them and eventually accustom them to being handled. He will be wise to do so, because it will then probably be necessary to pen the chosen birds for only three or four days to get them used to such confinement.

As a matter of fact, when they are furnishing up, they might well spend one full day a week in the cages, each bird, of course, by itself. White sawdust is the best litter for the floor, especially when a light plumaged fowl is the inmate; and, although poultry do not perch when they are on show in the usual way, a perch should be fitted in each pen for use when it has to be occupied overnight. Many a young fowl is excitable when first put up; but if strangers are not allowed to approach, and it is fed by the regular attendant until it has calmed down somewhat, it will

soon become quiet enough to be handled. During the period of training the fancier should spend some time with it each day, and also frequently take it out of the cage to accustom it to being examined. It will come to the front when it learns that its food is placed there; and healthy fowls do not require much teaching when their crops are empty.

Some people find it most difficult to remove a fowl

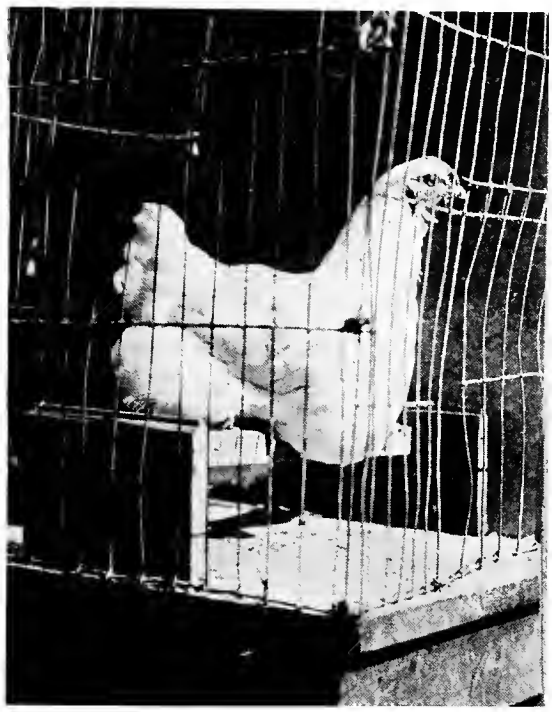


FIG. 236. IN THE TRAINING PEN

Fowls which are being trained for show in single cages should always be provided with a perch, and particularly after they have been washed

from a show pen; and I have seen more than one person drag a bird out by one wing or by its legs, tail first. Old fanciers, who know the value of a show specimen, generally place their right hand on the fowl's back, turn its body facing the front, grip its legs gently but firmly in the left hand, then, with a slight tilt, lift it out bodily head first. As a rule, the left-hand grip of the legs is enough to steady it; but if it be fractious, keeping it under the left arm or gently massaging its wattles between thumb and forefinger generally has a soothing effect. Some birds, however, are so nervous that they are much better left in their pens and not judged.

A Special Diet

During the time the fowl is being prepared for exhibition, while it is in the pen, it may be advisable to give it a special diet, even provided that the one which it gets daily is nourishing, as it should be to ensure vigorous health. The bird will be fed on grain only at the show; and rarely, if ever, have I known the diet to be otherwise, although during an event of long duration, some fanciers provide their birds with a small quantity of chopped fresh greens daily, particularly in summer. The usual diet is grain, grit, and water. No attempt should be made to fatten show stock; and it is not advisable to give them so much at one meal that they will not take the next. Three short meals *per diem* will keep a bird in good fettle; and when a vigorous cockerel is penned up, they could consist of wet mash for breakfast (a tablespoonful of biscuit meal soaked in boiling water with an equal quantity of bran and bound with a teaspoonful or more of best middlings), a tablespoonful of finely minced boiled meat and chopped raw onion at midday, and a handful of wheat in the evening. Fresh green food, clean drinking water, and grit should also be available. On alternate days less than half a teaspoonful of linseed jelly, or six drops of cod-liver oil, or a scraping of beef dripping may be added to the mash to increase the gloss of the plumage.

For hard-feathered birds kibbled peas and beans may be given for breakfast—steamed but not mashed—raw instead of cooked meat at midday, and a small quantity of barley along with the wheat in the evening; they do not require wet mash, while no fancier of my acquaintance gives his show fowls dry mash. Pullets and hens may have similar rations; but, as can be imagined, many such meals would probably bring the young birds into lay. However, among fanciers it is considered that a pullet is at her perfection of beauty when on the point of laying her first egg.

A few days before the show date the selected specimen should be examined; and barring misfortune it should be in sound condition, but most probably showing the dirt, in which case it will require to be dressed. Perhaps it is in this direction that most amateurs fail; they leave everything until the last moment, or if they are ahead with their preparations they omit to provide a suitable place in which the bird can be kept clean. I need hardly say that to return it to its usual run after being prepared would be somewhat unwise, for obvious reasons. Hence if a spare room, a shed, or a fowl house is available, let it be set aside solely as the training quarters. It can be fitted with slatted fronted pens, about 3 ft. square, or ordinary show cages, firmly fixed on a bench at a convenient height; the room should be well ventilated and light, but so shaded that the midday sun cannot shine on the inmates, and fresh without severe draughts. Such accommodation as this is always

advisable when birds are being shown, because on their return from the exhibition they should be isolated for a day or so before being turned down with other stock.

On the other hand, if much is being made of the exhibition side of poultry-keeping, then it is well-nigh imperative to have several cockerel boxes or similar small houses for the use of the special birds throughout the season; but few novices would begin on such a scale. Before leaving this subject of training I would caution amateurs against the use of cockerel boxes as the actual training pens for young stock; they answer well enough for old stagers which are frequently exhibited, and for such birds, in fact, they are ideal. But since there is sufficient room in a cockerel box to enable the bird to hide on the approach of anything it may deem suspicious, it is apt to become very nervous. In a training pen it is forced into close contact with human beings, so that by the time its show career commences it is ready to face the world. This matter of training may appear to be a trivial one; but, as an old hand at judging poultry, I assure the amateur fancier that a well-trained fowl is much more likely to catch the judge's eye for handling than one whose sole aim appears to be to get through the front or the top of the pen, being quiet only when it is crouching in a corner.

FIG. 237. THE TRAINING ROOM

When teams of poultry are exhibited or much trade is done in show stock, a room is specially fitted out with pens, so that the selected birds can be trained and thoroughly overhauled. The above depicts part of a training room of a well-known fancier's establishment, through which many winners of champion prizes have passed

Washing Show Specimens

Condition is not the only point which is taken into consideration when fowls are judged at exhibitions; but most adjudicators have a decided preference for those specimens which are placed before them in a cleanly state. Whether they are right or wrong in so doing matters little. The fact remains; and since that is so, it is advisable for fanciers to pay particular attention to the subject. In the preparation of fowls for exhibition there are many different phases which must be considered, but not the least of them is washing. To the novice, there are apparently few things which are more difficult to accomplish properly than washing a fowl. But despite this, it is a much

more simple undertaking than many poultry-keepers seem to imagine. There is no secret in it, and after a very little practice the whole process is found practically as easy as washing a rag. So great is the propensity of dust to adhere to the plumage, and more particularly to that of the soft-feathered breeds, that almost every variety requires a certain amount of dressing before being staged for competition.

Different classes of birds, of necessity, require different treatment. Game fowls, for instance, and male birds of a dark colour should not have their feathers completely soaked; but pure white fowls, and those which have much white about them, generally want a thorough wash prior to their appearance in the show pen. Buff-plumaged birds of a light shade have been considerably improved by it, and so, evidently, have red fowls; and to such an extent of recent times have the latter been washed that the Rhode Island Red Club of the British Empire has considered it necessary to warn its members that judges have been instructed to pass all exhibits which, in their opinion, have been "over-prepared." There is certainly no excuse for washing a well-bred buff or red fowl during its preparation for the show pen, because those which are bred for exhibition are not kept where their plumage is likely to get dirty; and fanciers can well remove dust, and maintain natural colour with brilliance of plumage, without bathing their birds.

Only white or almost white fowls should be bathed; but it must not be attempted if the bird has started to cast its feathers, since the almost inevitable result will be a sudden moult. It is rarely, also, that a cockerel or a pullet requires a wash before being shown for the first time, because, although it will remove from the skin and fluff the scurf which is found in most young fowls, the tubbing is very apt to loosen the plumage to such an extent that the chicken drops into a false moult, while it also has a great tendency to remove the natural gloss from the feathers. When the plumage of young birds appears to be dirty, much can be removed by means of a handkerchief held in the steam of boiling water and smoothed over the feathers while it is slightly damp; the remainder will disappear if the bird be kept for a week in a pen littered with clean oat straw or white sawdust, the place being cleaned each morning and afternoon. An occasional rub down with an old silk handkerchief (dry) does much to ensure fowls' plumage being clean and glossy.

Most amateur fanciers make the mistake of not attempting to wash their exhibit until the day before it is dispatched, with the result that if anything goes wrong there is no time to rectify it. They should practise washing birds which are not required for show, and thus gain experience and confidence. I always advise beginners to commence with a cock, because, while he may be somewhat difficult to pacify at first, his plumage is much easier to wash than that of a hen, as his narrow hackle feathers need not be webbed again so perfectly to look presentable. Moreover, male birds of many breeds require washing in parts only, chiefly their hackles, back, and wings, for which parts a soft and rounded nail brush is the best utensil for the purpose. However, presuming a White Wyandotte hen has to be prepared she will need a thorough wash; in fact, it must be thorough or not at all, because a half wash is useless.

Tubbing a Hen

To make ready, scrape some pure white soap (buttermilk) into a jug of boiling water, so that there shall not be any lumps to get into the feathers. Three ordinary zinc baths will be required; or if white enamel baths are used a rubber mat on the bottom will prevent the bird slipping. Let each contain comfortably warm water to the depth of six to eight inches. Into the first put a piece of washing soda and pour the melted soap; and into the third squeeze the blue bag, because a little blue (and even that little looks very blue in the water) gives a wonderful brilliancy to a good white bird. And here let me remark that this is considered to be quite legitimate dressing and not dyeing; and every exhibitor has a perfect right to use it, as certainly do all good "washers." Some showmen add clouded ammonia to this third bath of water, and others hydrogen peroxide; but, while such chemicals will remove soap from white feathers, their use is not countenanced. A large sponge, a couple of bath towels, and an exhibition hamper lined with clean hessian and with clean dry straw on the bottom, will also be required.

All being ready, clean the hen's head and legs with soap and water if necessary—those parts should be kept clean while she is in the training pen—then stand her in the first bath. With the sponge, soak her to the skin from head to tail; and see that the water penetrates to the skin. Lather the soap well into the feathers; but do not use a brush, because it will prevent all but her hackle feathers webbing again. They will not break, provided they are not rubbed directly "against the grain"—always rub them the way of the barbs, that is, wash down the feathers not against them. Sometimes a tail, the breast, or a wing wants rubbing for upwards of five minutes before it is thoroughly clean; but clean it must be, or washing had better not be attempted, since a badly-washed fowl will not be worth penning for a prize. Having completed the wash, put the hen into the second bath and rinse all the soap and dirt out of her feathers;

and finally rinse in the blue water, which will be cool but not cold—all soap must be removed from the plumage.

When the bathing is completely over, place the hen on a chair or anything clean under foot, wrap a warm towel around her and press out as much moisture as possible, repeating with the second towel if necessary; or rub her plumage gently downwards with a piece of new flannel, warmed. Either will take much of the moisture out; but the bird must be thoroughly dried, and it is in this part of the preparation that many novices fail to make their birds present the best possible appearance.

Drying Out

The hen should be allowed to dry in the hamper, which must be placed near a stove, but not so near that any extreme heat will reach her to blister the skin or to curl the feathers. The lining of the basket should be turned back from one part; and attention is necessary to see that the hen turns herself to the heat so that all parts of her get a chance to dry almost simultaneously. Obviously the hamper must be out of a draught; but while the whole process should take place at a time when the bird may be in a warm room for six to eight hours, the air must not be stuffy, and particularly is this essential if an oil stove is the heater. A blue-flame stove is well worth the expense, because it is not advisable to wash a fowl at night in the kitchen where the fire is likely to be out an hour or so afterwards, as this would probably result in the bird getting a chill. The stove can be regulated not to smoke, and it contains enough oil to maintain it for at least twelve hours.

Much has been written at times anent the great tendency of the fancier to increase the size of his fowls. But in many instances, and particularly among exhibitors of such breeds as Orpingtons, Cochins, White Wyandottes, and other soft-feathered kinds, this increased size has been due more to the improved methods of drying the birds than to any undue fattening for exhibition purposes. In short, instead of putting the fowls into a wicker basket before the fire, they have been allowed to dry in a patent drying machine, or, as it is generally known, a "fluffing-out pen." The result of this arrangement is that the plumage webs well; and it causes the fluff of the fowl, indeed the whole feathering, to "stand out" more than it would do if the bird were dried as previously mentioned. Personally, I am not in favour of this method of drying birds, except for a naturally soft-feathered breed such as the Cochin, because it is decidedly opposed to the stipulation in the standard for the plumage of Orpingtons and Wyandottes, in addition to which it gives them a false appearance.

As a rule it will be found that a complete wash removes the gloss from the plumage. For this reason, therefore, the operation should be performed some days before the show; and if during the intervening time a small quantity of linseed is added to the diet, there will be a fresh secretion of oil, and the birds being kept perfectly clean in their training pens will be in an excellent condition on show day. It is considered by some novices that for white or buff fowls it is not of much importance; consequently such birds

FIG. 238. DRYING OUT

Towelling a hen after she has been washed for show, and prior to allowing her to fluff out

are very often washed on the day before being exhibited. But it is beneficial to have a good lasting lustre on the plumage of all light-coloured exhibits. Many fowls, if kept in proper hard plumage, do not need a wash; but loose-feathered birds always become comparatively dirty. On the other hand, such breeds as Cochins, and of later days White Wyandottes and Orpingtons, even though clean, are often washed merely, as has been mentioned, to increase their apparent size.

Cleaning the Head and Legs

So much for the plumage; there are other parts of the bird to clean before it can be said to be ready to face the judge. Its head appendages—comb, wattles, red lobes, and face—should be well sponged until all traces of dirt are removed, and then anointed with a few drops of sweet oil, working them well with the finger and thumb, which softens the texture and improves the colour. White lobes are somewhat tiresome to keep in good condition. Highly-fed fowls, and those which do not get sufficient exercise, generally suffer from lobe trouble; and yet if white-lobed birds are permitted to have unrestricted liberty in all weathers the lobes become damaged and discoloured, and they would need to be confined for weeks in order

to restore the quality of the lobes. However, particularly with young fowls required for exhibition, it is best to keep them sheltered in a light lofty place.

Daily attention will keep the lobes in good order; but should they become shrivelled, or lose their brightness, bathe them frequently with tepid milk, work them well between the finger and thumb, and afterwards dust them with a small quantity of zinc

FIG. 239. SHOW PREPARATION

Cleaning a hen's legs and feet to brighten them before applying the orange stick. All dirt must be removed from the scales

powder or starch powder. It sometimes happens that red streaks appear on white lobes. If these are caused by neglect they can generally be removed by the before-mentioned treatment; but if due to small blood-vessels traversing the lobes nothing can be done to improve them. Then, again, it is difficult to remove white spots and patches from red lobes—in fact, it cannot be done in a legitimate manner. Paleness of the lobe can be remedied by giving the bird a tonic to improve the circulation of the blood. A little brisk rubbing will often mend matters, and exercise in a small, sheltered run is necessary; anything to cause greater flow of blood to this particular part of the body will help to overcome, even if it does not entirely dissipate, the defect.

The legs and feet should be scrubbed to remove all dirt; and a piece of ordinary washing soda in warm water will greatly aid matters. If the legs are at all scaly, it is not sufficient merely to clean the surface, since dirt often lurks beneath the scales and does not improve the appearance of the shanks. However, it will pay the exhibitor to expend a little extra time on white or yellow legs, and to manicure them as one would manicure one's own finger-nails—i.e. use a spear-headed orange stick, and afterwards polish the scales and even the nails. An orange stick is advocated in preference to anything else; it is smooth, and to clean the scales with the blade of a knife is not only apt to injure the leg and cause bleeding, but it so roughens the surface as to provide a harbour for dirt. When the legs are cleaned and dried they should be rubbed with sweet oil, and polished with a piece of old silk or similar material. It is perhaps as well to add that all oil, powder, and the like used on the head appendages and legs must be thoroughly removed before the birds are finally staged at an exhibition.

Let me impress upon beginners the importance of sending their fowls to a show in proper condition. The birds should get a liberal supply of soft food before they start; and they should be packed in round baskets, which will permit of their standing upright without injury or inconvenience to their combs or tails. Many cocks of the large-combed breeds have lost prizes because they have been put into baskets which would not allow them to stand up without pressing the comb down. The bottoms of all baskets should be covered with straw.

Exhibiting Utility Birds

Although the breeding of pedigree poultry, whether for high egg production or for conformation to the several points of the "Standard of Perfection," is undertaken by specialists, and requires considerable knowledge gained from years of experience before it can be made a complete success, the exhibition side of utility poultry-keeping is well within the purview of the novice whose stock is pure bred. It simply means that, in addition to managing the birds for laying or table purposes, he will have to pay some attention to the Standard. To make a success of it the Standard must be studied, while, obviously, he must patronize the shows if he intends to go in for breeding stock and thus have hatching eggs for disposal. The utility section of the show is a very important one nowadays; and although the birds which are entered in competition thereat must be possessed of laying qualities, and as such be subject to handling when they are being judged, they should conform in no small degree to the general characteristics of the Poultry Club Standard.

However, in the matter of perfection of colour, markings, head points, and so forth, a much greater

latitude is allowed than when the stock is being exhibited in what is best described as the Fancy section; consequently it is not necessary to breed so strictly for those external points. The aim should be to combine good utility properties—almost invariably egg production—with those which denote that the birds, although they can lay, are not merely

FIG. 240. A BUFF ORPINGTON COCKEREL—UTILITY TYPE

Fowls of the stamp of the above cockerel are claimed to be correct representatives of the original Orpingtons of 1880, and which to-day are known as "Old Type" to distinguish them from the Modern exhibition birds. There is only one standard for all varieties of Orpington—whether they be Black, Blue, Buff, or White—but, comparing this photograph with that of the Modern Black hen, as well as the Blue Orpington cockerel illustrated in Chapter IX, it will be seen that there is a vast difference in the general outline and feathering. The Old Type, however, is unquestionably the best for general utility purposes, i.e. for laying, and table bird production

mongrels, but belong to a specified breed or variety as the case may be; in short, that they are good-looking fowls which will produce reliable laying stock. It amounts to nothing more than keeping a recognized pure breed instead of developing egg production solely without regard to the established standard; and it is well known that nowadays the breeder of pedigree layers finds it more profitable to keep named breeds than egg-producers whose type is unrecognizable.

When showing standard-bred fowls in utility classes, as I have said, much latitude is allowed; but it will be understood that absolute blemishes are not tolerated. For example, take the White Wyandotte. It would be obviously a mistake to enter a single-combed, white-lobed, or black-legged bird in a class for this variety, because the standard for the breed clearly defines a rose comb, red lobes, and yellow legs; and even though, for each of these parts of the bird, the actual allowance in the scale of points be as low as 5 per cent, the fact of the exhibit possessing one or other of such blemishes would spoil its chance of getting noticed, no matter how well it handled for laying capacity. Then, too, a judge would be correct in passing, in such a class, a bird whose plumage was yellow all over. On the other hand, if the judge were a practical breeder he would not leave a particularly good handler without a prize card simply because its plumage was tanned on the surface by exposure to the weather, or its legs were almost white, its lobes pale, or its rose comb not of the cradle outline demanded; or even because the comb fell over to one side instead of being firmly set on the head. Such faults would certainly be taken into consideration by him, but not to anything like the extent they would be with birds in the Fancy section. This also applies to feather markings and colour, although even they should be distinct enough to enable one to differentiate between, say, a Welsummer and a Brown Leghorn hen and a Red and a Buff Sussex.

However, the foregoing are external points. The novice who is going to show his stock should make a selection of his pullets when they have furnished and before they come into lay—it is hardly advisable to exhibit those which have just started, because the change from the quiet run to the showroom will probably put them off lay for some weeks. It does not matter so much with those which are in full lay, or with matured stock. Perhaps one or two can be found which will do him credit, even if they do not get the first prize. The birds should be handled for the points I have mentioned in Chapter IV; handling is essential, of course, when Fancy stock is being judged, but it is of much more significance for utility birds.

Selecting Likely Specimens

Any fowl with bodily deformity—crooked breast-bone, round or roach back, wry tail, and so forth—should be discarded, and also one which is too big, or with coarse bone and profuse feathering, or with such defects as a thick and beefy comb, a puffy or very wrinkled face, dull eyes—and especially green or yellow eyes—and heavy brows. Select the neat-headed, alert-looking bird, whether male or female,

which has bold and almost sparkling eyes and bright comb and wattles of medium size. Texture must be fine throughout; and this refers to the bone, the flesh, the feather, and horn, i.e. beak and toe-nails. Anything in the way of coarseness should be avoided when selecting a likely winner for a utility show; but do not choose a midget simply because he or she is of fine texture—it is not difficult to get texture in the undersized specimens, but what is wanted is a well-developed body which fills the hands when the bird is being held.

Length and breadth of back, length of breastbone, abdominal cavity, and pubic or pelvic bones are all important. Avoid a fowl with a narrow back, and especially across the saddle or cushion, or with legs too close together, because the good layer, whether pullet or hen, and the well-bred cockerel stand wide. If the pullet is in lay her abdomen should be well developed, of good width and depth, but soft and pliable, handling almost as a silk eiderdown quilt would feel to the touch. The pelvic bones should be straight and pliable, not turned in at their points or "cow-horn" shaped. Quality and quantity of plumage must also be considered; it should be close and almost silky, but not woolly or matted. Having found two or three birds which answer fairly well to these points, select the one with the best breed type, and see that it is perfectly healthy. The novice can gain much by trap-nesting his pullets, because it gets him accustomed to handling each bird, and comparing the good producers with the medium, and the medium with the bad, although, of course, this is not possible until the bird is in lay.

Now whereas there is a "Standard of Perfection" for exhibition (fanciers') stock, there is no fixed standard which is universally adopted for the laying hen or pullet, and the male bird to mate with her for the production of layers. There have been several score cards formed by enthusiasts; but the score card system of judging has never been popular in this country, if for no other reason than that three judges scoring the same bird independently on the same day would probably not agree as to the total number of points to allow, while many a bird has had different totals awarded by the same judge at shows within a week or two of each other. Many endeavours have been made to tabulate a standard for utility poultry, one which will be acceptable to the vast majority of those who are so keenly interested in the breeding, showing, and judging of such stock; but so far they have failed. Hence, it is advisable for the exhibitor to adopt the hints given above, to follow as closely as possible the breed characters of the Poultry Club Standard, and to send his birds to the show in sleek condition.

Preparing the Birds

It must not be thought that training, washing, and dressing are not necessary for utility exhibits. In the early days of utility shows, and certainly at the first few of these events, the birds were staged as they were picked up from the runs, in robust condition as a rule but without any preparation. They neither showed to advantage, nor, indeed, were they a credit to their owners. Admittedly, laying stock should have as much freedom in their runs as the owner can allow them, and especially during their growing stage; but they should get a little special attention for exhibition. Having selected the bird he is going to show, therefore, the novice should give it the final touches.

If the choice be a hen or pullet which has been trap-nested and frequently handled she will be of a friendly disposition, which is natural to nearly every good layer. A few days prior to the show date rub a little sweet oil on her comb, face, and wattles, to remove any dirt or scales. The head points can then be brightened up considerably with a light sponge over, first with warm water, then with cold water. Unless the hen is a white one, this cleaning of the head and a thorough cleaning of the legs will be all that is necessary, except a final wipe over the plumage with a silk handkerchief. White fowls, if at all soiled, should be washed two days prior to dispatch. Exhibitors of utility stock, as a rule, do not take quite the trouble that fanciers do in preparing their show specimens; but there is no reason why the birds should not be penned at their absolute best—to set off their good points.

There are just a few more hints concerning the showing of live poultry, and they apply equally to the fancier as to the utility exhibitor. When dispatching the bird see that the hamper is clean—one which is stored in the outhouse during the off season is apt to collect dust, which, if not removed, will not improve the appearance of the exhibit. Put some clean straw on the bottom; and see that the bird can stand in it with ease. Single fowls are generally packed in round baskets—show hampers—which should be well lined; but when two or more are sent at the same time, square or oblong hampers are preferable, the compartments being made with stout canvas and allowing no more width than the inmates require in which to sit, although high enough, of course, to permit of standing. Care must be taken to have the canvas sewn securely to the sides and bottom, and also to a rod across the top to prevent any chance of the birds interfering with each other. Strap the lid on; or if string is used tie it in a bow, not a knot. Tie the label—which has been sent by the

show officials—securely to the hamper by four corners; and see that the return address is correct.

If it can be arranged, let the bird travel by day, dispatching it by an early train in the morning prior to show date. Most show officials are ready for penning the exhibits in the evening; and it causes considerable delay if the birds arrive in the morning of show day, besides which it does not allow them time in which to get settled down before judging commences. Fanciers who exhibit teams of fowls —some of them as many as a score, perhaps more, on occasions—invariably take their birds with them and pen them early in the morning; but the single bird, sent by rail, stands as good a chance as any, because show officials are very careful with the specimens entrusted to them.

Visit the Shows

Having done everything possible to pen his bird at its best, the novice will probably visit the show; but he will have to wait until judging is over and the show is opened to the public before he can see whether his selection has got a ticket or not. If the first prize card is on the pen, well and good; if not, try to find out from the judge just where the exhibit fails—he will probably spare a few minutes to point out the faults in detail, and the novice should benefit by the knowledge gained. The ideal fancier is neither an optimist nor a pessimist but a philosopher, who takes the bad with the good as a matter of course; and I can think of no better advice to give an amateur than to be philosophic when disappointments arise. The wise man will regard these disappointments as part of his education, because they will not only inure him to a state which is inevitable in exhibition circles, but they will set him to discover the why and the wherefore of these happenings. Let the novice begin with a breed which has not too many intricate points and which does not require washing to make it fit for show—such a breed, for instance, as the Croad Langshan, or the Australorp, or the Old Type Black Orpington, all of which are good for general utility purposes—and, having mastered it, strive for greater things; but he must learn to walk before attempting to run.

To return to the show, however, and the return from the show. While it is essential that attention be accorded the birds prior to their dispatch to a show, it is equally important that they be carefully attended when they return home. Most buildings in which poultry exhibitions are held become hot during the event, and more particularly, perhaps, in autumn and winter than at other seasons; hence it is advisable to be careful with fowls on their return. They should not be placed immediately in an open run, but put into the training room or into an ordinary exhibition pen fixed in a shed or outbuilding. This will ensure their getting gradually used to the outer temperature, and it will, moreover, enable the poultry-keeper to see that they are fit. It will generally be found that a day in such a place is ample, and if they eat well they can with safety be placed in their usual run at dusk or when the other fowls have retired for the night. When the exhibitor does not attend to this matter, he often wonders why his show stock go out of condition so quickly. More often than not, it is simply from the sudden change of temperature that a fowl catches cold and is ill.

Showing Eggs

At many poultry shows, and especially at those which are held in connexion with agricultural societies and by local utility and fanciers' clubs, classes are provided for new-laid hen eggs; and, often, fees are not charged, the excellent stipulation being that the eggs shall go to the local hospital. As a rule, competition is limited to three classes, viz. for white, tinted, and brown; but so many poultry-keepers appear to be unable to distinguish between tinted and brown eggs that it would be much more satisfactory if only one class were provided, for eggs of any colour, or at most two classes, one being for white eggs and the other for those of any colour, as such classes, not stipulating tinted or brown, might induce the breeders of Araucana fowls to let the public view the green and blue-shelled eggs which these birds produce. Occasionally I have seen quite an extensive classification for hen eggs, such as white, cream, tinted, light brown, dark brown, mottled, and speckled—which made it somewhat difficult to know where one colour ended and the next began—while at a few shows classes are provided for the eggs of specified breeds. On the whole, however, the egg classes do not attract many entries, although the showing of eggs at local events is simple enough for those who care to take a little trouble, and certainly an easy phase of exhibiting for novices.

There is no need to keep a special breed for the purpose, because some of the very best samples I have judged have been laid by hens which had no pedigree and decidedly no known breed name, while others have been selected from the regular supplies of a dairy, the selector being an expert buyer and frequently supplying his customers with sets for exhibition. However, at local and members' shows, the eggs are laid by the exhibitor's own birds, for such is generally stipulated; and it is in classes like these that the novice might well enter. Unless special breeds are catered for, the eggs can be from any pure breed, cross, or mongrel, as long as they comply with

the colour stipulated. At one time the largest white eggs were laid by the Black Spanish breed, but of latter years the Black Minorca is probably the best producer of such eggs among the pure breeds.

Most of the general-purpose fowls lay tinted eggs, while the darkest browns are produced by Croad Langshans, Barnevelders, and Welsummers, although I have had some deep brown eggs from Light Sussex

FIG. 241. EXHIBITING EGGS
A display of eggs, for competition, at a poultry show

and Rhode Island Reds, as well as from positive barndoor hens. Colour, nevertheless, is not a strong point in the judging of eggs, except that white eggs should be "the colour of driven snow" and with no tint of cream; but it is a mistake to imagine that one has to show rich-coloured eggs to secure a first prize in a class for brown eggs. Far more important are the size of the egg, the texture of its shell and the quality of its contents, while good matching or uniformity of the exhibit as regards size, shape, and colour counts for much more than the density of the shell colour.

In the breeding of layers one naturally aims for the production of birds which shall produce standard (2 oz.) or special (2¼ oz.) eggs, of the quality defined by the Ministry of Agriculture as sound shelled, with translucent or faintly but clearly visible yolk, translucent and firm white, and an air space which does not exceed ¼ in. in depth. Such, then, are the eggs which should be chosen for exhibition, whether they be white, tinted, or brown; and, all other points being equal, those known as specials would get the first prize. Colour of shell is, therefore, merely a matter for those who arrange the classification, while the suggestion that deep-coloured eggs are necessary to win first prize in a class for brown eggs is simply the fad of a judge. Personally, like the vast majority of judges, I am free of such a whim, in fact opposed to it, recognizing that to encourage it would be to the detriment of practically the whole of the general-purpose breeds. When selecting eggs for show purposes, therefore, I advise the novice to pay more attention to the other points I have mentioned than to colour, provided the colour comes within that which is demanded.

Natural Colours Required

He will probably find it sufficient trouble to choose six eggs to match, because six is generally the number required to make up the exhibit. His greatest difficulty perhaps will be to understand what is meant by "tinted," since a tint is a slight colouring or a pale or faint tinge of any colour; or, as explained in Webster, "a colour considered with reference to other very similar colours; as, red and blue are different colours, but two shades of scarlet are different tints." The nearest he can get to it is a very slight colouring of brown, similar to the stain of a very weak solution of potassium permanganate—which, I may as well caution the novice, must not be used to colour his white eggs for show. At any rate, those very thoughtless people who do so run the grave risk of being disqualified, because it is not at all difficult for an expert judge to detect such false colouring.

The colour must be natural, as produced by the hen, and to preserve which, in all its freshness, requires very careful handling. Obviously, those who exhibit eggs should be particular about keeping the nest material clean and odourless, and collect the eggs with clean hands, even to the extent of having washleather gloves specially for the purpose. This is certainly advisable with some rich brown eggs with a matt surface which can be very easily rubbed off, while it is just as essential with white eggs. Hen eggs which are dirty should not be washed before they are exhibited, although those from dirty nests can be cleaned with a damp cloth as soon as they are collected; but they should not be polished.

The Essential Points

To be successful at showing eggs, therefore, the essential points are size, texture and cleanliness of the shell, clearness of contents, shape, and finally match-

ing. Size, i.e. weight, I have already mentioned—strive for the 2¼ oz. egg, but not very much heavier, because it is apt to be double-yolked, which would disqualify it, as single yolks are demanded. Texture of shell can be ascertained by the process known as "candling," by means of a strong light, the light being shaded and leaving only a small aperture before which to hold the egg. Texture depends upon the swell to about half way, and then a somewhat sharp finish to the opposite end, but both ends well rounded, and the small one not narrow or pointed.

Finally there is the matching or the uniformity of the exhibit—six eggs of one pattern, and that pattern including size, shape, and colour. For such a purpose many exhibitors select the product of one hen, or pullet, if the latter's eggs are large enough. This

FIG. 242. TABLE FOWLS

A display of table fowls—cross-bred cockerels and pullets—at the London Dairy Show. As will be seen, the pullets are on the top bench and the cockerels below

condition of the bird at the time of production; and some eggs laid by very prolific birds have thin and brittle shells which break with the slightest pressure.

Then, too, there are those which are abnormally porous and others with air cracks, while any displacement of the yolk or disturbance of the shell membranes, causing a faulty air space, as well as blood spots, can readily be detected by such examination. One can tell by handling whether an egg is rough shelled, while, of course, candling is not necessary to discover any with wrinkled ends or with extra deposits of lime on them. As to shape, those which are inclined to be long and narrow or the reverse, almost like a golf ball, are useless for exhibition. The ideal shape is a broad dome at one end, a gradual entails storage in a dry and cool place, with the eggs resting on their broad domes; but since a fortnight may elapse before the requisite number is collected, the earliest may show signs of staleness. Hence it will answer for most small shows if they are selected from the week's supply, or those laid the same day, if possible. An exhibit of white eggs must not have one which is a cream tint, while of browns, six of a medium colour are preferable to five dark brown and one a few shades light.

When packing them, each should be wrapped in a square of greaseproof paper with a twist at the small end, which should be uppermost, and put into a sectional egg box. It is better to deliver the eggs by hand than to send them by rail, because however

careful the railway officials are, a severe shaking or a sharp jar of the box might very easily spoil the contents of the eggs, by displacing or even breaking the yolk, or disturbing the shell membranes. If possible, also, each exhibitor should unpack and arrange his own set, the show officials providing plates for the purpose, although, as a rule, the steward whose duty is to display the eggs can be trusted to make the best of it. A final word: as the judge is permitted to break one egg in each exhibit, do not show stale or faulty specimens.

Exhibiting Table Fowls

Generally speaking, when classes are provided for table fowls for open competition, the bulk of the entries are made by exhibitors who are thoroughly accustomed to table bird production, whether the competition is for live or dead (dressed) chickens. At the small events, nevertheless, the conditions and prize-money offered are such that the amateur is encouraged; and they are the shows at which the novice should enter his birds.

In the vast majority of cases the schedule issued in connexion with them contains full particulars of what is required. Live chickens may be exhibited singly, in pairs (cockerel and pullet), or in couples of either sex, according to the classification. The classes may be for pure breeds or crosses, the latter being sometimes specified as, for instance, Indian Game and Sussex cross, which, in a pair class, means actual first cross of these breeds and not an Indian Game cockerel shown with a Sussex pullet. Competition, also, may be for fattened birds or for country chickens, i.e. those which have not been crammed. Similar conditions may also apply to the exhibits in the classes for dead stock. Hence, before making an entry, it is essential to read the rules very carefully, and to apply to the secretary of the show if the conditions cannot be thoroughly understood, because everything depends upon the rules governing such competition.

When exhibiting live table fowls it is not necessary to subject them to a thorough wash; but nothing is lost by staging them in a clean condition, their head points and legs being prepared with as much care as is advisable when showing layers or other valuable birds. They must be constitutionally sound, with straight keel-bones, well-set legs and feet, and without a structural flaw; and they should be fleshy if not fat —fattened if so demanded—with a well-filled keel, because a sharp and "bladey" or prominent breast-bone is detrimental. Width and depth of the front, and little, if any, offal behind, are good points. Dead table chickens should be carefully plucked to avoid tearing the skin; and on no account should they be dusted with flour. The breastbone (the keel-bone) must be straight, and the crop empty, although some skilled exhibitors seem to know just what quantity and quality of "food" to leave in the crop to give the breast an especially good appearance.

Matching is Necessary

However, the beginner will be exhibiting country

FIG. 243. PRIZE PULLETS

A pair of cross-bred (Game and Sussex) pullets which were awarded first prize and the gold medal in the Table Poultry section at the Dairy Show, London. These birds were particularly well fattened

chickens, trough fattened at most, and will fast them before killing, as mentioned in Chapter X. If pairs or couples are required, the birds must be matched, for colour of skin at any rate in the pair class, and for colour, shape and size when couples (cockerels or pullets) are stipulated. The birds must be young, the skin white for preference, the cockerel without the least sign of a spur—but if spurs have been developed they must not be removed—and the pullet with her comb scarcely grown. The legs must be clean, and the vent also, and any blood washed from the beak and face.

If sent to the show by rail, the birds must be as carefully packed as they would be were the very best market their destination. They must be clean plucked, except on the head and the upper parts of the neck, while before they are tabled their wings should be folded over the back, if tying down is not permitted. They must not be drawn and trussed, because "dressing" means simply plucking, stubbing, and singeing; and they should not be skewered. A correspondent, evidently a novice at exhibiting, once wrote to me, from a farm in Kent: "I sent a pair of fowls for competition to a show and was disqualified, because I filled up the loose skin between the breast and the legs with fat, to make the birds look plump and handsome, as I always do when sending fowls dressed for table to my customers." But that is trussing, not dressing; and even in a class for trussed fowls the judge would be correct to pass such birds, because the fat was added by hand and not "grown" in those parts of the birds.

If a class for table poultry at a show be for "pair of chickens, trussed," then the exhibits in it should be trussed for roasting or boiling. That is, they should be shown with their heads and necks off, their wings and feet trimmed, the carcass devoid of internal organs, and either skewered or sewn up—i.e. trussed with skewers or string. On the other hand, if the prizes be offered for the best dressed birds, the exhibits should be merely plucked—except for the neck-hackle—and, probably, tied. There is a vast difference between trussing and dressing. The former means preparing the bird for the oven or the spit; the latter merely for the slab, i.e. to look tempting. In this latter case, therefore, the head should be left on; and any exhibit which had the head cut off and wrapped up with paper would be passed or disqualified if I were judging, unless provision were made for it in the schedule of the show.

Everything hinges on those conditions; but too often they are very vague. At some shows the classes are for "Dead Fowl Plucked (breastbone not broken)"; at others, for "Couple of Plucked Chickens"; and yet again, simply "Dressed Poultry. Exhibits with the breastbone broken will be disqualified." It would simplify matters to state in connexion with dead table poultry that the exhibits should be rough picked and dressed ready for market, but not trussed or drawn. In fact, such conditions as those imposed in connexion with the section at the famous Dairy Show, London, could well be printed in every schedule in which classes are provided for table poultry. They are as follows: "All birds in these classes must be sent killed, plucked—except on head and pinions—and tied as for market purposes, but not drawn, scalded, floured, singed, or skewered. Breastbones must not be broken. Exhibits must not be artificially treated in any manner likely to deceive the judge. Fineness of quality, smallness of bone, and absence of offal will be considered in preference to mere weight. Decorations and distinctive marks of any kind are absolutely prohibited. Vents must not be tied or tampered with in any way." In most cases trimmings are not permitted, and neither are breaking down the breastbone, loosening the wings, or other forms of deception. However, the judge who knows his work can be left to detect any such irregularities.

Whichever branch of exhibiting the amateur poultry-keeper decides to take up, I advise him to visit a few shows, and particularly those at which a fairly extensive classification is provided. The season opens very early in summer and continues until late winter; and since poultry shows are held in most parts of the country he can, by visiting them, not only spend a few most interesting days, but gain much by carefully inspecting the exhibits and noting just what is favoured in the breed or branch in which he intends to specialize. Often enough also he can, if so disposed, get into conversation with exhibitors, because many of them attend the shows, some travelling long distances to do so; and, on the whole, fanciers are good sportsmen and always willing to give the novice a hint or two.

CHAPTER XIV

MENDELISM AS APPLIED TO THE BREEDING OF POULTRY

JOHANN GREGOR MENDEL (1822–84), a then unknown observer of supreme intellect, was Prälat of Brünn, in Silesia, and it was in the quiet garden of the Abbacy that he worked at the problem of the mechanism of the distribution of hereditary qualities in some of its aspects. It is his long-neglected but epoch-making discoveries which are discussed here. To obtain a clear idea regarding the functioning of what is termed the Mendelian Law, it is necessary to understand something about what other workers had succeeded in accomplishing and to appreciate the theories they put forward. The modern idea of Evolution is a generalization of Darwin's view of the origin of species. Heredity is restricted to the variation and transmission of characters in the individual bird, animal, or plant. The first application of Darwin's work was to the inter-relations of species; it has broadened out in its conception in Evolution, and in Heredity it is limited to a process in the organism.

Briefly stated, the Darwin-Wallace theory provides for: (1) A power of variation in the individual; (2) an inheritance of such variations; and (3) an elimination of the less fit or, as it is generally called, Natural Selection. There is little doubt that a power of variation exists in the individual, but Darwin did not determine wherein this power lay. In all probability it lies in the propagative part and not in the individual (bird, animal, or plant), that is, in its body or soma. The difference between the propagative part (the gamete) and the body part (the soma) is explained later. If it be true that the factors determining variation are present in the propagative part, then it is unquestionable that they may be transmitted sooner or later—in subsequent, but not necessarily the next, generations—while if the variation be in the body of the individual (the result, say, of environment or if artificially produced), it cannot be transmitted, unless this variation has also affected the propagative part; and there is no proof that the latter is possible.

If a bird or animal be mutilated, for example, the mutilation cannot be transmitted to the offspring. Game cocks may be used as an illustration. For many years, probably hundreds of years, it has been customary to "dub" Game cocks; that is, to reduce the comb in size by cutting the greater portion of it away. Such cocks have been used as breeders for numberless generations of Game fowls, yet the chickens still continue to appear with combs of the original shape and size. The transmission of acquired peculiarities or traits is not within the power of the body of the organism. Darwin's Natural Selection is of the highest importance, for only fit varieties are preserved and the unfit ones are eliminated.

The next in the field was Weismann; and his research was a great advance in the mechanism of Heredity. Weismannism is a remarkable attempt to explain inheritance, although his system must ever remain a noble, but unfinished, contribution. He insisted, and justified his insistence, that the power of variation lay in the primitive germ-cells of the sexual glands—the propagative part—and he denied the possibility of the transmission of acquired characteristics or traits. He encountered serious difficulties in his work; and, unfortunately, he was not conversant with Mendel's contemporary labours, or otherwise he might have overcome them. In failing to recognize the vast importance of Mendel's studies he acted as did other scientific men of his time.

Reproduction

A clear discussion of Mendelism is only possible when a few questions involved in reproduction are considered. In the case of poultry we find male and female, for sex has differentiated. To effect reproduction each of these has a special internal gland, known as the sexual gland. In the case of the female this gland, the ovary, contains eggs or female gametes —the eggs mentioned here do not refer to the shelled eggs as laid, but to the microscopic eggs present in the gland. In the male sexual gland there is a mass of sperm cells or male gametes. When the male gametes are introduced into the body of the female, the female and male gametes unite to form the fertilized ovum or zygote; and from the zygote the chicken is developed, male or female, and, generally, it may be said to be like its parents and their ancestors. The gametes and the zygote they form are the determinants of heredity; they determine the heredity of the chicken developed, and the chicken bears a close resemblance to its progenitors. This is the meaning of the expression "Like begets like."

Broadly speaking, it is not difficult to understand why like breeds like. The chicken develops from the union of two minute cells from the maternal and paternal sexual glands, hence from the zygote which is made up of a male and female gamete. When development begins the zygote forms two primary

divisions. One of these gives rise to the body or soma of the future chicken; the other is the propagative part or the primitive germ-cell mass, and it is from this latter part of the zygote that the gametes eventually arise. It is probable that the germ-cell mass develops into a number of primitive germ-cells and, when the body or somatic part of the bird is developing, they pass into the individual to form, with other tissue, the sexual gland. Each primitive germ-cell is a zygote; but they all undergo changes while in the sexual gland and lose certain of their determinants, as well as their power of developing into an individual. They become gametes; and before a fertilized ovum or zygote can be produced in the future it is essential for two gametes—a male and a female—to unite.

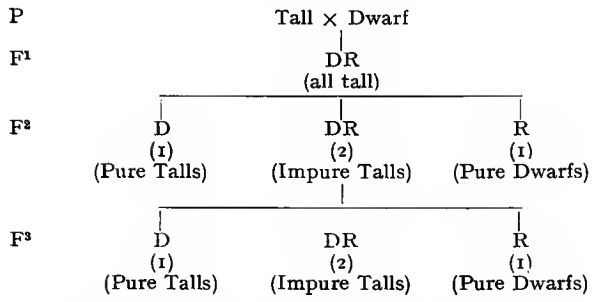
The male and female gametes are spoken of as being "reduced" primitive germ-cells, since they have lost some of their determinants; they have in them an incomplete number of the determinants of heredity. When the male and female gametes unite, a zygote is produced which has the full number of determinants. Each gamete is incomplete in its determinants of heredity, but the union of a male and female gamete gives a completed heredity to the individual and also to subsequent generations.

Mendelism

It has been stated that Weismann's contribution was unfinished—he failed to solve the question of the mechanism of the ratio-transmission of "characters" in succeeding generations. It was here that Mendel stepped in and made such a remarkable advance. It was known as early as 1676 that the anthers in a flower were male sexual organs and this made cross-fertilization possible. It was only necessary to dust the pollen of one variety of species of plant on the stigma of another to secure positive and variation-fertilization. Many workers between 1761 and 1849 established important facts by their cross-fertilizations; but they arrived at no definite conclusions, for the reason that they did not carry their experiments through succeeding generations to a finish. They were so wrapped up in the question of the apparent advantages of cross-fertilization that they went no further. Mendel, a man trained in physics and biological science, was a genius. He devised experiments along accurate lines and carried on with them until he obtained a definite solution of the problem. His statistical investigations were equally as important as his experimental work. His idea was to experiment on plants possessing contrasted characters by cross-fertilization at the beginning and by self-fertilization afterwards. He followed up the behaviour of the contrasted characters in subsequent generations; and he experimented for eight years upon accurately thought-out lines.

The edible pea was selected in its many varieties, since it was considered to be the most suitable for the work, its advantages being that it is hermaphrodite (carries organs of both sexes), it is self-fertilizing, not greatly exposed to insect cross-fertilization, and artificial cross-fertilization is easy. Seven varieties were chosen each with one contrasted character, but with the remaining characters common to all. They were: (1) Shape of seed; (2) colour of cotyledon; (3) colour of seed skin; (4) shape of pod; (5) colour of unripe pod; (6) flowers axial or terminal, along the axis or at the end; and (7) height of plants, tall or dwarf. The result of each set of experiments was practically the same, so it will suffice if the last mentioned is taken for illustration. The peas selected in the experiment in connexion with height were tall, 6 ft. to 7 ft., and dwarf, 1 ft. to 1½ ft. The pollen of either parent plant was dusted on the stigma of the other selected parent, suitable precautions being taken by covering with muslin bags. The original plants selected were termed P (parent); the first generation F^1; the second generation F^2; and so on. The result of the cross-fertilization was most striking. All the plants in F^1 were tall, from 6 ft. to 7 ft. There were no plants at all of an intermediate size and no dwarfs. This result had, of course, been obtained on many occasions previously, but subsequent generations had not been raised. It was simply accepted, even by Darwin, as an advantage of cross-fertilization as against continued self-fertilization.

The plants in F^1 were termed Impure Talls, or Impure Dominants, and self-fertilization gave remarkably peculiar results. F^2, the second generation, gave both tall and dwarf, in the proportion of 3 : 1. When these dwarfs were allowed to fertilize naturally—the pollen permitted to dust adjacent stigmas—they bred pure, and in the many generations which were raised from them only dwarf plants appeared—they were Pure Dwarfs. The tall plants in F^2, when self-fertilization took place, gave a different result altogether. One-quarter of them were proved to be Pure Talls, since self-fertilization in subsequent generations produced nothing but tall plants. One-half, however, proved to be Impure Talls, in that they behaved in exactly the same way as the Impure Talls of the second generation. One-quarter were dwarf, and they continued to breed pure for this character ever afterwards—they were Pure Dwarfs. Mendel called the tall character Dominant; the dwarf Recessive. The Mendelian scheme can be shown diagrammatically, D standing for the Dominant (Pure Tall), DR for Impure Dominant, and R for the Recessive (Pure Dwarf), as follows—

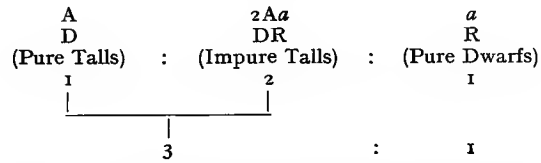


The Mendelian ratio is accepted as being 1 : 2 : 1.

The DR Plants

When the Mendelian ratio comes to be applied it is not quite so simple a matter as might be expected from the above. The difficulty arises from the fact that the Pure Talls and the Impure Talls cannot be distinguished from each other. Whether the talls are pure or impure can only be told in the following generation, since the former (one-third) then breed pure for tallness, while the latter (two-thirds) behave in the same way as the Impure Talls in F^1. The contrasted qualities in these cross-fertilization experiments were described by Mendel as the unit-characters —tallness and dwarfness in plants are unit-characters. One of the most important results of Mendel's work is that he showed that these contrasted unit-characters do not blend in consecutive generations; they sift out unaltered in a definite ratio, they are autonomous and not blendable. Thus, after F^1, dwarfness does not modify the tallness, or vice versa, but each unit-character eventually appears in a definite ratio.

The question naturally arose in Mendel's mind as to how this happened. He evolved the theory of Gametic Segregation; that is, the contrasted and recognizable unit-characters are pure in the gametes. Mendel believed that the unit-character of tallness was present pure in the gametes of the tall plants, and the unit-character of dwarfness was present pure in the gametes of the dwarf plants. As Dr. Berry Hart suggests, this can be put simply as follows: If "A" represents the Dominant character and *a* the Recessive, then $(A + a)(A + a)$ by algebraic multiplication gives $A^2 + 2Aa + a^2$. If the squares are omitted we get

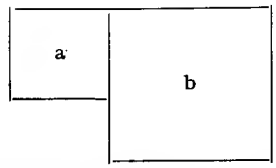


The 1 : 2 : 1 shows the Mendelian ratio, the 3 : 1 the somatic (body) Dominant and Recessive ratio.

To sum up, Mendel showed that contrasted unit-characters were Dominant and Recessive, non-blendable, and that after cross-fertilization they sifted out unchanged in definite ratios. He explained the sifting out by his theory of Gametic Segregation and the ratio according to the "law" of probability. Dr. Berry Hart points out, however, there are difficulties in the way of accepting the theory of Gametic Segregation. He brings forward three contentions, as follows: Why should all the plants in the first generation—F^1, the result of the cross-fertilization—be tall and not talls and dwarfs in the 1 : 2 : 1 ratio? The recessive quality reappears in F^2, and as it is only temporarily recessive is it not equal to the dominant? The recessive quality reappears in F^2, and it does not appear in the body or soma of the plants in F^1, so where is it?

A fowl consists of a body part or soma and a propagative part. The first is the result of fertilization or the union of a male and female gamete; the second is in, but not of, the soma and it is set apart for future reproduction, as it contains the gametes. A gamete, either male or female, does not contain all the determinants essential to form an adult and its offspring; but when a male and female gamete unite the resulting zygote contains the complete determinants. The gametes are derived from the zygote and pass into the soma or body, but they are not influenced by the soma; they hand on their propagative part unchanged. When the zygote divides into the propagative part and the somatic part, as explained earlier in the chapter, the somatic or body part does contain determinants; but they influence only the one generation. It is the determinants in the propagative part which affect future generations. Determinants of qualities are contained in the gametes of the sexual gland which are not present in the soma. In other words, determinants are "interned" in the gametes of the sexual glands of a fowl, the effect of which is seen in the progeny, although not actually present in the soma of the parent.

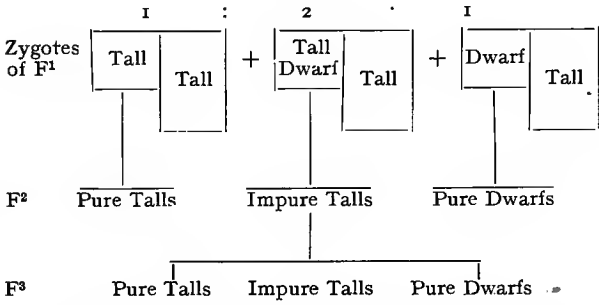
Dr. Berry Hart explains this in an exceedingly interesting way. The zygote consists of a propagative part and a somatic part. The former gives rise to the male or female gametes and these are handed on and alone determine the nature of the plant. The somatic part, which forms the soma of the plant, lasts for a generation only. The propagative part is for the race; the somatic part for the individual. He suggests an amendment to the Mendelian scheme. An outline figure expresses what has just been stated. If a small square, *a*, is taken to represent the propagative part, and a large square, *b*, is taken to represent the somatic part, in each of which determinants lie, we have—



This investigator shows the Mendelian scheme drawn as follows—

Gamete of tall plants with tallness pure (Dominants) × Gamete of dwarf plants with dwarfness pure (Recessives)

gives three kinds of zygote



The zygotes of the Pure Talls have this unit-character in both the propagative part and the somatic part. The zygotes of the Pure Dwarfs have the unit-character for dwarfness in the propagative part, but in the first generation the unit-character for tallness in the somatic part. In the propagative part of the Impure Talls both unit-characters—for tallness and dwarfness—are present; hence they give rise to Pure Talls, Impure Talls, and Pure Dwarfs. This explanation is not opposed to Mendelism, because it accepts the transmission of unit-characters unaltered and their sifting out in a definite ratio. The sifting out is due to changes in the zygote, to interchanges between the somatic and propagative parts of each zygote, and gives rise to the 1 : 2 : 1 ratio in the unit-character determinants of the propagative part and not to gametic combination. It is the propagative cell determinants which determine the Mendelian ratio. They are the important part in the plant's, bird's or animal's life history—they determine its propagative value. But this explanation does not remove the student's difficulty in that it is impossible, save by breeding farther, to differentiate between the Pure Talls and the Impure Talls, or the Pure Dominants and the Impure Dominants.

The special facts which the reader should bear in mind are: (1) The unit-characters do not blend, but are autonomous. (2) The determinants of a character may be "interned." They may be interned for only one generation, such as dwarfness in the case of the pea experiment, but they may not make their appearance for a number of generations. If delayed for a few generations it is termed recession; if for a very long period, atavism. The explanation of this delay is that the unit-character is "interned" in the propagative part and not in the soma; therefore, until it appears again it is not visible in the individual. The words Dominant and Recessive are spoken of, and it is sometimes suggested that they possess special qualities, particularly in the case of the latter. The words, however, imply only a difference in the time of transmission, since it is the Dominant unit-character which appears alone in F^1, the Recessive not appearing until the second generation, F^2.

Heredity

A fowl is made up of a very large number of unit-characters. These include size, body shape, colour of skin, form of comb, colour of leg, number of toes, and colour of plumage as visible characters. There are many more unit-characters in connexion with the invisible part of the bird, such as fecundity, size of egg and proneness to broodiness, to mention only three. These are all the determinants in the developed adult and are caused by the determinants in the gametes of the parents. All progeny from the same parents do not come exactly alike. The question arises, therefore, how do these determinants act before the union of the gametes and after fertilization? The progeny from the same parents certainly have much alike, but still they vary considerably. Here we must go back a short way. The zygote is formed by the union of two gametes. These gametes are reduced primitive germ-cells and do not possess a complement of determinants, while the primitive germ-cells are derived from the zygote, after a re-arrangement of the determinants. The gametes in the sexual gland contain different unit-characters. The gametes of the propagative part are modified by reduction, so, as the gametes form the zygote and the primitive germ-cell mass is derived from the zygote, this gives a clue to the origin of variation.

Other facts which stand out strongly are: (1) Parents may transmit characters which they do not show as individuals, for these are present only in their propagative part. (2) Characters may appear in the offspring which have been "interned" for generations. (3) In the light of modern discoveries to which reference is made later—when sex-linked inheritance is discussed—it is probable that, when the unit-characters are redistributed in the development of the zygote, the female progeny follow, in the main, the sire to a much greater extent than do the male progeny, and vice versa.

Poultry-keepers are concerned with the application of Mendelism which deals with the transmission of

good and bad qualities. It is evident from what has been said that the unit-characters, being autonomous, are transmitted in a definite ratio unchanged. Bad qualities are not improved or good qualities toned down, in heredity transmission. This is very often contradicted by practical poultry-keepers, since the first generation, F^1, may show only the Dominant bad quality or good quality, as the case may be. But they come out in a definite ratio in future generations. In this connexion a highly debatable subject must be mentioned, namely, the effects of in-breeding. A conclusion cannot be arrived at from the result of the first mating, since only the Dominant unit-character comes out in the first generation. It is perfectly true that related birds have more unit-characters in common, and so there is more chance of these appearing in their progeny. On the other hand, however, there are bad unit-characters in all stocks or strains, and these may appear more frequently, in subsequent generations, when in-breeding is practised. In the case of laying fowls, breeders do their utmost to increase fecundity, and "line-breeding" is often adopted. The extremely artificial conditions under which the birds are kept tend to lower their vitality, and their stamina is sapped by long periods of heavy production. This is a bad unit-character which is liable to appear more frequently in subsequent generations.

The use of fresh blood in the strain, while it may introduce good unit-characters, may also bring in bad ones, but fewer common unit-characters; so there is less chance of bad ones appearing, although there is also a risk that they will turn up later, but certainly less seldom than when in-breeding is practised. But there is a limit to improvement by crossing, or the introduction of fresh blood, and by in-breeding. Body size and the number of eggs laid, to take only two characters, cannot be increased beyond a certain limit, while there is always a tendency to pass or to deteriorate to the average race size and average production. The general improvement effected by introducing fresh blood is explained by Mendelism. In such a crossing, attention is fixed on the contrasted unit-characters only. There is also a similar ratio-change, however, in the common qualities; if one parent has greater vitality in its unit-character the result is an improvement in the vitality of many of the progeny.

The Practical Value of Mendelism

A knowledge of Mendelism is of the utmost value to the poultry-keeper in numerous directions. Many present-day breeds have been produced by crossing two or more breeds, while in some cases they have been improved by the introduction of an alien race. It is for this reason that in some strains of White Wyandotte, for example, a percentage of the chickens come with single combs. In other breeds it may be the appearance of five toes instead of four, or a variation in the colour of the leg. Such imperfections cause the poultry-keeper a vast amount of trouble; but with a knowledge of Mendelism, such undesirable characters can be eliminated.

Take the case of a single comb appearing among White Wyandotte chickens; a rose comb is a standard breed point. To use Mendel's words, the single comb is a Recessive unit-character. If single-comb "blood" has been introduced at any time, one-quarter of the chickens in each generation raised from the rose-comb parents will appear with single combs. The single comb may be likened to the dwarf unit-character in Mendel's pea experiments. Three-quarters of the chickens have rose combs, but only one-third of them are pure for rose comb (Pure Dominants) and two-thirds are Impure (Impure Dominants). Unless the pure rose-comb birds can be picked out, single combs are bound to recur in each generation. They cannot be picked out by any visible signs; but, since rose comb is the Dominant unit-character, they can by breeding. To eliminate the single comb from the strain for ever, each rose-comb chicken, when it arrives at breeding age, should be mated with a single-comb bird. It is essential, of course, to mate singly, unless trap-nests are employed, so that the progeny can be credited to their own female parent.

Pullets which produce any single-comb chickens from such a mating are Impure Dominants and should not be included in the breeding pen. Those pullets which do not produce any single-comb chickens are Pure Dominants and they may safely be used for breeding, since they will continue to produce rose-comb chickens alone through subsequent generations. It will be realized that both parents must be pure for rose comb. It is necessary, therefore, to test the males (by breeding) before they are used for the production of stock chickens. Each rose-comb male should be mated to a single-comb hen—the breed of the hen does not matter—and the chickens noted. If any come with single combs the male is an Impure Dominant and should be discarded; if all come with rose combs the male is a Pure Dominant and may safely be mated to the Pure Dominant pullets.

The Recessive unit-character can always be determined, since it appears in only one-quarter of the chickens, while the Dominant character appears in the remaining three-quarters of the second and subsequent generations. A further lesson to be learnt from Mendelism—one which many breeders have discovered for themselves from their practical observations—is that it is essential to work from individual birds and

not from several females with one male. This fact must be emphasized. It may be stated at once, however, that at the present there is little that Mendelism can do for the breeding of fancy stock, because the scale of the experimentation, and the meticulous attention which would be necessary in the analysis of the fine points dealt with by the fancier, could not possibly be rewarded with at all commensurate results. In this matter the art of breeding is in advance of the science; the geneticist is not in a position to produce, or to tell anybody else how to produce, winners in the established breeds, specimens finer than those which foregather at the shows. Many experiments would have to be made and much work done before the production of first-prize winners became an exact science.

Fecundity

Much credit is due to the fancier for the way in which he has developed many breeds of poultry. An exceedingly exacting Standard was formed, but it was concerned almost entirely with external details of little utilitarian significance. He naturally worked with those characters which he could see and to which he could attach a value. The introduction of the trap-nest gave the utility poultry-keeper his great chance of increasing the fecundity—a hidden character—because it enabled him to measure accurately the productive performance of each bird, while it made it possible for him to compare one female with another on the basis of egg production. One of the earliest attempts to increase fecundity with the aid of trap-nest readings was made at the University of Maine. In this case each female was trap-nested for a year, and only those which laid 150 or more eggs during their pullet year were used as breeders. Each year—the experiment was carried on for nine years—the males heading the flock were selected from hens with records of 200 or more eggs. It was hoped that this would show a rapid increase in average production; but it was not so, because the average production of the flock showed no increase at all.

Now I must refer to the statement made under "Heredity," viz. "it is probable that, when the unit-characters are redistributed in the development of the zygote, the female progeny follow, in the main, the sire to a much greater extent than do the male progeny, and vice versa." It appears as though fecundity is a sex-linked character, at any rate to a considerable degree, and that the power of heavy production is transmitted from the sire to his pullet progeny more than to his cockerel progeny, and that the power of heavy production is transmitted from the dam to her cockerel progeny more than to her pullet progeny. If egg-production tendencies are inherited in the way that has been generally supposed, it is difficult to understand the non-success of the University of Maine's nine years' test. The explanation is that the males were chosen blindly from dams which had laid 200 eggs or over during their pullet year. The productive performance of the male was not measured, and, if we apply Mendelism as we can, many of the males used must have had potentialities considerably below that of their mothers. The fact that dams were used which had records above the average of the flock is not sufficient to guarantee any improvement in the average of the flock. Neither the dams nor the sires were pure for the high-production unit-character.

The difficulty is to pick out the males which have the power of transmitting their dams' heavy laying character, because it is, of course, not visible, although a little may be gathered from certain bodily characters, by handling, as explained in Chapter IV. But if we apply Mendelism we discover a way of determining the quality of both males and females—by the progeny test, the one which Mendel himself applied. The term progeny test, as applied to poultry-breeding, refers to the estimation of an individual's value as a breeder by means of the qualities or performance of its offspring. Too many breeders judge the individual bird by its ancestors, but the most successful breeders reverse this and judge the individual's value from its progeny. It is, in fact, the only way in which definite results can be obtained; but it is not commonly adopted, since it involves a vast amount of work and occupies a number of years if the work is to be done properly. And yet, as it is the only real method, the work and the time taken are more than justified.

When making a progeny test it is essential to consider the qualities of *all* the offspring of a single mating. Egg production is an economic quality of paramount importance. In this case it is the value of the entire family which is alone of importance. The majority of poultry-keepers cull their birds, and this is an economic procedure; but if a progeny test is to be made it must not be practised, and one must do what Mendel did—consider all the progeny and not isolated specimens. Not only are entire family averages necessary, but it must also be known what variability there is in the number of eggs produced by the individual members of the family. It is this which makes individual matings or trap-nesting essential. The consistently excellent performances of entries in different Laying Trials show that fecundity can be increased as demonstrated by the average over the birds entered. Such consistent strains have undoubtedly been built up along Mendelian lines,

although possibly their owners were not aware of the fact.

Applying the Progeny Test

When the progeny test is applied it is necessary to trap-nest entire families, because it is highly important, for the purpose of elimination, that the breeder should have the record of the members of a poor-producing family as well as that of a good-producing family. If a group of cockerels is to be tested, the usual plan is to arrange the necessary number of breeding pens—one for each cockerel—of hens with practically equal egg records. Untested hens may be employed for this purpose—birds which have passed through their first laying season, but whose progeny quality is not known. The average production of the pullet progeny is used as a basis for comparison of the ability of the different males to transmit egg-production tendencies. This plan also allows for the testing of females within a single pen, and, since all of their daughters receive the determinants for egg production on the paternal side from a single male, the test is even more critical than that provided for the males.

Some exceedingly interesting progeny tests have been carried out at the Agricultural Experiment Station of the Kansas State College of Agriculture and Applied Science, Manhattan, Kansas; and the following particulars are taken from the report issued. Numerous figures must be given if the value of the progeny test is to be appreciated, but I think that those produced here—they have been altered slightly in form—will be readily grasped. Three matings were made of single-comb White Leghorns. In one case the male had six hens; in the other two instances each male had seven hens. The hens were selected as having produced the same number of eggs during their pullet year. The results were as follows—

INDIVIDUAL EGG RECORDS OF DAUGHTERS OF SIRE M1

Dam A	235, 202, 254.
Dam B	195, 219, 199, 207, 222, 214, 224, 186, 237.
Dam C	288, 264, 220, 219, 230, 244, 216, 208, 270.
Dam D	207, 166, 231, 257,
Dam E	192, 233, 251, 206, 246.
Dam F	240, 247, 174, 224.

Daughters' average record: 224·3 *eggs.*

INDIVIDUAL EGG RECORDS OF DAUGHTERS OF SIRE M2

Dam G	115, 232, 203, 246, 248.
Dam H	169, 217, 207, 210, 200, 150, 200, 194.
Dam I	199, 153, 167, 152, 192, 150, 221, 201.
Dam J	181, 117, 183, 164, 164, 174.
Dam K	236, 235, 234.
Dam L	210, 205, 217.
Dam M	278, 269, 268, 253, 236, 213, 228, 227, 223, 220, 212, 206.

Daughters' average record: 205·6 *eggs.*

INDIVIDUAL EGG RECORDS OF DAUGHTERS OF SIRE M3

Dam N	218, 137, 152, 171, 158, 82, 115.
Dam O	229, 242, 160.
Dam P	75, 61, 181, 175, 183.
Dam Q	203, 193.
Dam R	211, 224, 178, 164.
Dam S	203, 155, 144, 142, 224.
Dam T	141, 199, 81, 118, 224, 211, 186.

Daughters' average record: 168·2 *eggs.*

These figures make it plain that Sire M1 had daughters giving the highest average, while Sire M2 was not very far behind, but Sire M3 gave daughters whose production was, on the average, 56·1 eggs lower. They show farther that Sire M1 and Sire M2 are worth retaining for another season, but that Sire M3 should be discarded.

For the breeding of cockerels to be used later for stock purposes both Sire M1 and Sire M2 should provide promising ones. The cockerels from the mating of Sire M2 and Dam M should prove the more promising, but those from the mating of Sire M1 with Dam C should not be very far behind. The results may be employed for comparing the females to be used for breeding from the untested daughters. Although the poorest laying from Dam M produced only 206 eggs, she is preferable as a breeder to the heaviest layer from Dam I whose total was 221 eggs, since both were sired by the same father—Sire M2. There is always a risk in selecting an untested individual—the breeding qualities of the pullets produced by the three matings, details of which are given above, are not known—but the risk is greatly reduced when the choice is confined to uniformly high-production families.

A Prepotency Index

It is not always possible, however, to select females for a progeny test with similar laying records during their pullet year. When this happens it is necessary to make some allowance for the variation in the dams' records. Instead of using the average production of the daughters as a basis for comparing the transmitting power of males, a prepotency index may be obtained from the average records of both their daughters and the hens to which they were mated. Referring again to the test suggested by the Kansas University experts, this can be done in a fairly simple way. The first step in calculating a male's prepotency index is to compute the average production of the daughters of each female mated to him. The resulting average may be accepted as a measure of the combined transmitting tendencies of both parents. The dam's inherited tendencies for egg production are indicated by her individual record, but the male's are unknown. The male's ability to transmit egg-production tenden-

cies must lie somewhere between the record of the dam and the record of her daughters.

The Kansas experts believe that a male's breeding value, as far as egg production is concerned, can be estimated in the following manner: If the daughters' average is above the dam's record then one-half the difference should be added to the daughters' average. If, on the other hand, the daughters' average is below the dam's record then one-half the difference should be subtracted from the daughters' average. This is based on the assumption that if a daughter's record is below that of the dam, such a difference is due to the fact that the sire carries high-production tendencies to a less degree than the dam. If his daughters are superior to their dam the reverse is assumed to be correct. The value arrived at is an estimation of a male's inherited tendencies for egg production. A male's prepotency index is, therefore, the average of the estimations obtained from the groups of daughters of the various hens mated to him. If the daughters' average is below that of the dams, the male's index will also be below, and vice versa. It will be appreciated that this method is open to inaccuracies, but broadly speaking it does provide important information. For example, a male which produces daughters with an average production of 250 eggs from 230-egg dams is much more valuable as a breeder than one which produces daughters with an average production of 250 eggs from 260-egg dams.

If a definite mating is taken the results will explain how the prepotency index is obtained.

EGG RECORDS OF HENS AND DAUGHTERS OF SIRE M4

	Dam U Record 261	Dam V Record 253	Dam W Record 298	Dam X Record 245	Dam Y Record 230
	230	210	262	165	261
	241	186	247	231	243
	200	147	283	265	252
	301	175	303	—	275
Average	243	179	274	220	258
Index	234	142	262	208	272

The prepotency index of the male is 223.

The index figure for the dams is arrived at as follows: In the above table the daughters of Dam U had an average production of 243 eggs. This is 18 eggs less than their dam's record of 261 eggs, so one-half of the 18 (that is, 9) is subtracted from the 243, leaving 234. The 234 is the index value for mating Sire M4 with Dam U. In the case of Dam Y the daughters' average is 28 above their dam's record, so one-half of this is added to the daughters' average, giving an index value of 272. The male's prepotency index is arrived at by taking the average of the indices calculated for the dams. Thus the value, 223, is the average of the index figures in the above table. When a number of breeding pens is used in the test the males are ranked according to their index value.

A Shortened Progeny Test

To make a complete progeny test occupies a great amount of time over a number of years; and for this reason many poultry-keepers do not make it. The males in the test are a year old when they are first mated; they are eighteen months old when their daughters begin to lay; they are two-and-a-half years old when the full year's record for each of their daughters is completed, and they are entering on their fourth year when the next breeding season arrives and the best of them are used for reproducing the race. It is not, however, only a question of time, important as this undoubtedly is. Before the end of the three years many things may have happened to the males —some may have died owing to disease or accident, while their reproductive capacity may have been reduced by partial sterility. In the case of females, if hens entering on their second laying season are employed at the beginning of the test, they are entering on their fifth year when their full value as breeders can be recognized; and egg production diminishes as the hen grows older. Yet the full test is essential if accurate details are to be obtained.

Some valuable particulars regarding the breeding value of the birds may be secured part way through the test. It is generally recognized that the annual record of a pullet can be determined fairly accurately —only fairly accurately, because some pullets do not possess the necessary power for long-continued production—by the number of eggs produced during the first thirty days after the first egg has been laid. The performance of the pullets from a particular mating during this period certainly gives an indication as to the success or otherwise of the individual hens and the male. The two important factors are the age at which the first egg was laid, and the rate of laying during the next thirty days. J. A. Harris, from a study of 415 White Leghorns, found that the average production for October, November or December was a dependable basis for predicting the average annual production. Three months are given, though this is scarcely necessary under modern conditions, so as to allow time for the later-maturing breeds to come into production. In the vast majority of cases the month of November proves the most suitable one, since light and heavy breeds have both started laying by the beginning of the month. Again it must be emphasized that all pullets produced from each mating must be trap-nested if reliable results are to be obtained.

It is suggested that the first thirty days after the appearance of the first egg should be taken. In some instances, however, this may require a slight alteration, because it occasionally happens that at first the eggs are not laid at the characteristic rhythm. Such birds are the exception, and the irregularity persists for only a few days when it does appear. In a case of this kind the record should be made from the thirty-day period when the bird shows a regular rate of production. This is quite a simple matter, since the trap-nest records give the necessary particulars. The exact result of one mating, in tabular form, will explain how the details should be considered. In this case Sire M5 was mated to eight hens.

SIRE M5

Dam Number	Eggs for First 30-day Period				
	Eggs 1–10	Eggs 11–15	Eggs 16–20	Eggs 21–26	Eggs 26–30
AA (12 pullets)		1	3	4	4
BB (4 pullets)	1		2		1
CC (13 pullets)				7	6
DD (6 pullets)			3	3	
EE (11 pullets)		1	6	3	1
FF (11 pullets)			1	2	8
GG (6 pullets)				1	5
HH (6 pullets)			3	2	1

70 per cent of the pullets produced over 20 eggs.

The male heading the pen, in this case Sire M5, is judged according to the percentage of his daughters which come into the last two columns; that is, produced more than twenty eggs during the thirty-day period. The breeding value of the females may also be estimated in the same way; but since the number of their pullets varies so greatly the results are not so dependable. A table of this kind tells two stories. In the first place, when a number of pens is made up, the males can be graded according to their value. Even if it does not tell the exact value of the males, it does suggest which ones should be discarded and not used for breeding again. For example, if Sire M5 proved the best with 70 per cent of his daughters laying over twenty eggs, and another male gave poor results, say, only 30 per cent of his daughters came into the last two columns, it would be obvious that the latter was useless as a breeder.

In the second place, the particulars gleaned during this thirty-day period give an indication as to which individual mating would be likely to give the best cockerels. By being able to secure such breeding cockerels a year earlier than would be possible if the annual record of each pullet was waited for, a considerable amount of time is saved. By adopting this plan the average production of the family is increased, but not, of course, to the same extent or in the same certain manner as when the complete year's results are obtainable. It is for this reason that it is advisable to conduct the full test as well as the thirty-day test. There is a further advantage of running the shortened test. Before the male, say Sire M5, has been fully tested from the results of his daughters' year's test, something may happen to him. This would be a calamity, but much less so since some cockerels from the best individual mating are in existence.

From the table given it is possible to select the best individual mating for the production of breeding cockerels. All of the thirteen daughters of Dam CC laid over twenty eggs during the thirty-day period; nearly one-half of them laid over twenty-five eggs. This indicates that the cockerels from such a mating should be very promising, since they should be dependable for the transmission of high-production tendencies—considerably more dependable than cockerels chosen only because their dams laid a large number of eggs, as is customary with the majority of breeders.

Progeny Testing for Other Factors

Much of Mendel's success was due to the fact that he kept careful records of which he made full use. If Mendelism is to be applied to increasing the fecundity of a family of fowls, the statistical work necessary is not very laborious. But the number of eggs laid during the pullet year is, however, only one factor. Others of equal importance are: (1) Age when first egg is laid, in the case of the heavy breed birds. (2) Size of egg, a factor of paramount importance at the present time. (3) Shape of egg. (4) Texture of shell. (5) Proneness to broodiness, in the case of heavy breed birds. (6) Hatchability of the eggs. (7) Rearability of the chickens. It is taken for granted that the health of all birds concerned in the tests is perfect; if not, such birds should not be used for breeding purposes. In breeding for egg production in all its aspects, the poultry-keeper must determine which of the above-mentioned factors call for most urgent improvement. Then he can apply the progeny test in order of importance.

It is impossible to describe each test in detail; but the specialist breeder with his complete records for the year of all the various matings will possess the necessary data for making a wise choice of his breeding birds. The necessary statistical work is, however, beyond the average poultry-keeper, if he attempt to

improve too many characters at the same time. It is suggested that all efforts should be concentrated on the improvement of one factor, or at most two factors, those which the breeder knows to be of chief importance in his own case.

Capacity and Capability

It is possible to build up a strain or family with high-production tendencies; but it is quite another matter to induce the birds to give visible proof of their high fecundity. There is a difference between capacity and capability. The former is inherited; the latter, the result of many outside factors. A bird may have inherited the high-production tendency but, owing to bad management, incorrect feeding, improper housing and insanitary conditions generally, she may produce only a comparatively small number of eggs. Under the conditions she is only capable of producing a limited number of eggs. The reverse is equally true. A bird may have inherited the low-production tendency, but no matter how excellent the management, feeding, housing and other conditions she cannot be induced to lay one egg above her inherited capacity. This emphasizes the great importance of every breeder buying the best birds his pocket will allow.

It emphasizes another point. A poultry-keeper may purchase hatching eggs, day-old chicks, half-grown pullets or ready-to-lay pullets from a first-class breeder and pay a good price for them. If they do not turn out satisfactorily it is, in the vast majority of cases, unfair to blame the breeder, since in all probability the birds are genuinely bred-to-lay. The management should be overhauled, as the cause probably lies there. But Mendelism teaches that the inherited high-production tendency is not lost, although through improper management it does not appear in the individual, because it is present in the propagative part. Bred-to-lay pullets which, through mismanagement, have put up only a poor performance can be induced to lay heavily by improved management, while if they are used for breeding their progeny will inherit their high-production tendency. The only exception to this is that if the birds have been grossly mismanaged they may prove unfit as breeders owing to their lowered vitality, loss of stamina, and impaired constitutions.

Sex-linked Inheritance

A very important fact to be noted is that the Mendelian Law does not apply—as far as present-day knowledge goes—to all the unit-characters present in a fowl. Some characters pass from sire to pullet progeny and from dam to cockerel progeny entirely, and this, moreover, in the first generation, or F^1. This is termed Sex-linked Inheritance, although, as far as we know, it is not governed by the Mendelian Law. The law of Sex-linked Inheritance was discovered by Professor R. C. Punnett, of the School of Agriculture, Cambridge, and since it is in contradiction to the Mendelian Law—the law under discussion—full details need not be given; but it is necessary to deal with the subject. The majority of present-day races of poultry are either Gold or Silver breeds. Included in the Gold breed group are Black-Red (known also among fanciers as Brown, Brown-Red, Mahogany, Partridge, and Salmon, which are described in Chapter IX), Black, Buff, Gold and Red, while among the Silver group are Barred, Columbian, Cuckoo, Dark, Grey, Light, Silver-Grey, and White.

It should be noted, however, that the White Leghorn hen cannot be used as a Silver, and her only sex-linked character is the shank colour. The reason for this is that the white colour in the case of a White Leghorn is a Dominant unit-character and follows Mendel's law, so all resulting chickens from a cross in which it takes a part, irrespective of sex, come white or very nearly so in the first generation, F^1. The White Wyandotte, which was derived from the Silver-Laced variety of that breed, will prove serviceable, but only provided there is no White Leghorn cross in the cock's ancestry, which so often happens in laying strains of the White Wyandotte. Professor Punnett discovered that when a Gold male is mated to a Silver hen all the pullet chicks are coloured the same as their sire —black, brown, or buff—while the cockerel chicks take after their dams as regards the colour of their down—silver or white.

In connexion with the production of sex-linked (first cross) chicks, those in which the sexes can be distinguished on the day of hatching, it will be better for the practical poultry-keeper to consider the colour of plumage or nest down as two groups rather than one, viz. Gold and Silver, Black and Barred; in each case, as I have previously remarked, the name of the male's breed is given first. This division I suggest because, while a male bird of any variety (or colour) mentioned in the Gold group can be mated with Barred or Cuckoo females for sex linkage—the Black-Red stamp particularly so—it is not such that I recommend the beginner to adopt, chiefly on account of the difficulty he may find in distinguishing the cockerels among them. In the Black (male) and Barred or Cuckoo (female) union the cockerels among the progeny show a white mark on their head, either on top or at the back of it, this mark varying in size from a very small spot to a blotch, while the pullet chicks have pure black heads as regards the down. Some difficulty is experienced in separating the sexes if the Black sire has a preponderance of white in his undercolour.

Regarding the mating of other than a Black male with Barred hens, Professor Punnett assured me that a Welsummer cock mated to Barred Plymouth Rock hens would produce a perfectly straightforward sex linkage, as the black in the latter breed being dominant to the brown of the Welsummer, all the pullets would be full blacks in down, while all the cockerels would show the light head spot. The most popular link in these colours is a Black Leghorn male with Barred Plymouth Rock females, because both of these breeds have been bred for egg production. Very occasionally a cockerel of the Black-Barred union is practically black headed, but the down of such a bird is of a light shade. There may also be a dark brown specimen—although he would have a white spot on his head—or even a whole white cockerel, while I have also known of a dark brown pullet being produced; but such faulty chicks from the Black-Barred cross are rare, especially when care is taken in selecting the parents for density of colour and markings.

In the Gold (male) and Silver (female) union, it is the rule for the cockerels to be hatched with Silver predominating in their down and the pullets to be of Gold of some shade; and yet, in such unions there is often enough variation in the colours to puzzle the novice, because the shade depends upon the breeds used to form the link, and the care with which both sire and dam have been selected. Thus, to mention only a few, the Buff Plymouth Rock (male) and White Wyandotte (female) mated together produce cream-coloured cockerels (some of which have black ticking on their head and wings) and pale golden-brown pullets. The Rhode Island Red-White Wyandotte cockerels are cream or white, generally with tickings on the neck (but some have dark markings, almost black, on the back and wings), while the pullets are of a medium gold, generally with distinct dark brown markings on the sides, head, and back. Yet all these three breeds, when they are standard-bred, are self-coloured, i.e. devoid of markings.

On the other hand, the Rhode Island Red-Light Sussex cockerels are mostly cream and the pullets a dark shade of buff. The Brown Leghorn and Light Sussex mated produce almost white cockerels with black in places, and rich gold (verging on red) pullets with chocolate striping on sides and back, while the Welsummer-Light Sussex cockerels can scarcely be distinguished from those of their pure dam, and many of the pullets are very similar to Buff Sussex. All of the foregoing unions I have tried, and although sires from the Black-Red section of the Gold group generally produce pullets with more distinct striping than when Buff or Red males are the sires, the novice should choose as cockerels those chicks with silver in their down, and the gold chicks as pullets.

I have said that the only sex-linked character of the White Leghorn is the shank colour. When a male bird with slate- or willow-coloured legs is mated with a female having white or yellow legs, the cockerel progeny will have light shanks (like the dam) and the pullets, dark (like the sire); but it is doubtful if this colour difference would be sufficiently marked at the time of hatching. The light eye, too, is sex-linked, as can be seen by mating light-eyed Brown Leghorn hens with the dark-eyed Croad Langshan cock, the progeny being divisible into light-eyed cockerels and dark-eyed pullets. However, the beginner should find it much easier to try the plumage links of Black-Barred, and Gold-Silver.

Professor Punnett's discovery has proved of great benefit to the poultry-keeper, but perhaps more to the commercial poultry-farmer than to the small operator. It is possible to buy day-old pullet chickens and not a mixed consignment of males and females; the day-old cockerel chickens can be sold by the breeder direct to those who specialize in the production of table poultry. If the beginner produce a sex-linked cross himself he can either kill off the males —thus saving capital expense, in that fewer appliances are required for rearing, and the food bill is smaller— or he can rear them specially for rapid growth for killing at twelve or thirteen weeks for table purposes.

Sex-linked Pullets for Breeding

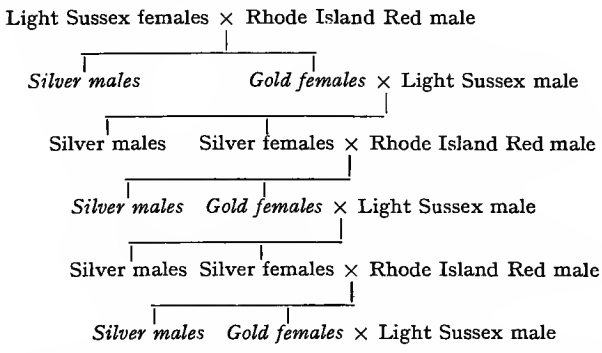
The colour of plumage is a sex-linked unit-character when a Gold breed male is mated to Silver breed females. This does not, however, have any effect upon the transmission of fecundity. It is, therefore, possible to produce pullets with high-production tendencies by carrying out a progeny test, either for the thirty-day period and/or for the full year period. The laying of the pullets will indicate the best mating or matings; that is, the males and females which possess the greatest breeding value. But a difficulty arises in this connexion. The cross-bred fowls (cockerels as well as pullets) cannot be used for breeding purposes. This means that it is necessary to carry out a progeny test with each of the males and females of the pure races employed for the production of the sex-linked (cross-bred) chickens. This would prove altogether too laborious, and since sex-linked pullet chickens have no value, save as layers, it would hardly be worth while.

The possibility of carrying out progeny tests is only mentioned to emphasize the fact that sex linkage has no influence upon the transmission of other unit-characters. No progeny test can increase the fecundity of one year's crop of sex-linked pullets, since they cannot be used for breeding; but by selecting better males and females for the next year's operations

cross-bred pullets with a more pronounced tendency to high production can be produced. If the sex-linked pullets are to prove profitable the parents must be chosen carefully; only the best "proved" males and females should be mated.

It has been stated that sex-linked pullets cannot be used for breeding. This is true, but only up to a certain point. If a poultry-keeper buys sex-linked pullets one year and does not desire to go to the expense of buying fresh birds every season or second season he may employ them for breeding, as demonstrated by Professor Punnett; but he loses the sex-linked character every alternate year. In other words, he can differentiate between the cockerel and pullet chickens at hatching time only every other season, which means that he loses one-half of the main advantage of sex linkage. There is no reason, however, why egg production should be decreased, provided first-class "proved" males are employed each year to head the pens.

The mating plan, as outlined by Professor Punnett, can be shown diagrammatically. Below, the sex-linked generations are in italics, the original cross being between Light Sussex females and a Rhode Island Red male.



and so on. It will be noted that when Silver females are mated to a Gold male the cross is sex-linked; when Gold females are mated to a Silver male the Mendelian law is fulfilled in that all the progeny exhibit the Dominant unit-character—silver plumage —in the first generation, F^1. The Mendelian law is only in abeyance when a Gold male is mated to Silver females.

Sex Determination by Feathering

I have said that the White Leghorn cannot be used to make a sex-linked cross, because the chickens cannot be differentiated at hatching time by the colour of the down. But the sexes can be distinguished in another way. The White Leghorn is a rapid-feathering breed. The Rhode Island Red, to mention one Gold breed, is a slow-feathering breed. If a White Leghorn male be mated to Rhode Island Red females—a rapid-feathering breed to a slow-feathering breed—the cockerel chicks are slow-feathering and the pullets rapid-feathering. Shortly after the chickens are hatched it is seen that the pullets have comparatively well-developed wing feathers, whereas the cockerels have not. Determination of the sexes can, however, be carried out only within a day or two of hatching, since, if delayed, the earlier-hatched males are not easy to distinguish from the later-hatched females.

A Sex-linked Pure Breed

In 1929 Professor Punnett succeeded in producing a pure race of poultry which shows sex linkage within the breed, so that the sexes can be distinguished at hatching by the shade of the down. Birds of this breed—the Gold Cambar—were exhibited at the World's Poultry Congress in 1930 at the Crystal Palace as a scientific curiosity. The sex-distinguishing character was sufficiently important, however, to warrant developing the breed; this is being done at the present time. One interesting development is that a Silver variety of the breed has been produced. The Silver Cambar should prove the more valuable, since the hens can be used for ordinary sex-linked crossing, both with respect to the Gold-Silver character pair (that is, with a Welsummer male) and with regard to the Black-Barred character pair (that is, with a Black Minorca), whereas the Gold Cambar hens can be used only with regard to the last-named character pair.

CHAPTER XV

THE DUCK INDUSTRY

DUCK-KEEPING has been in vogue in this country for hundreds of years, and the raising of ducklings for market, when carried out on an extensive scale, is generally a lucrative business. During comparatively recent times, however, attention has been directed to the duck as an egg-producer, with the result that several breeds have been introduced solely for laying; and the duck industry has gradually developed until to-day it has two clearly defined sides—the production of table ducklings and the production of table eggs.

FIG. 244. THE LAYING BREED

A fine group of White Indian Runner ducks on open range. This breed is a remarkably good one for egg production

Although it is only since the War that the possibilities of the duck for egg production have been realized, at least one authority has stated, from the experience he gained by keeping varying sized pens and flocks of laying ducks under different conditions, that he felt quite confident in recommending duck-keeping for egg production as a sole means of making a living, providing the marketing question is more carefully gone into by the producer than is the case with hen eggs. I may here state that this breeder was eminently successful, about ten years ago, with a flock of 500 laying ducks of the one breed. Now, while it is generally agreed that the large flock system of accommodating laying hens has played an important part in the development of commercial egg production, it is scarcely possible to adopt such methods when operating on a large scale with ducks for laying. Neither is it advisable under existing market conditions.

It must not be thought that in making this assertion I wish to cast the least doubt on the results achieved in the case mentioned. I have seen the figures connected with that experiment, and they prove conclusively to me that it was a profitable undertaking. I would not question the possibilities of duck egg farming as a commercial proposition simply because many people who went in for it at that time very quickly abandoned their ventures as unprofitable on account of their birds failing to produce the necessary quantities of eggs.

The duck, like the hen, wants understanding; and similar failures are not rare in connexion with commercial egg production from hens. But the great stumbling block has been, and is, the disposal of duck eggs in large quantities; marketing this class of produce is infinitely more difficult than is the case with hen eggs, because there is no gainsaying the fact that duck eggs are not generally popular. I know of a few instances in which breeders have a moderately good outlet for them; but, disposing of duck eggs for table

purposes depends solely upon the individual salesman, since whereas hen eggs sell themselves, it is by no means so with duck eggs. It is most difficult to convince egg consumers generally of the really excellent quality of these eggs because, most unfortunately, there is still a great prejudice against them, especially in the southern and western counties. And, as we know, prejudice is hard to kill.

The Prejudice Against Duck Eggs

The vast majority of people with whom I have discussed the matter consider that duck eggs are too strong for the ordinary palate; and it is undoubtedly because of this notion that they do not meet with a ready demand. A French chemist who analysed hen and duck eggs found that one hundred parts of the contents of the former contained 25·01 dry matter, 1·03 ash, and 11·27 fat, while the percentages of the same items in duck eggs were 28·32, 1·16, and 15·49 respectively, thus showing that they are superior in fat and nourishment to no inconsiderable extent.

Now, I would not go so far as to state that there has not been any justification for the prejudice, because I have had through my hands various samples, some of which certainly required an acquired taste to appreciate; and no doubt the reason for this prejudice can be traced to the marketing of fishy-flavoured, dirty, and inferior eggs due to the ignorance of those who mismanage ducks, or rather to the old idea of duck-keeping—that the birds be forced to eat whatever they can find, or, if fed at all, given refuse which would be considered unfit for hens. Obviously, under such conditions, the eggs were frequently too strongly flavoured, even for a hard-bitten pipe smoker; and anyone with a delicate palate could not possibly relish them. But this I do state most emphatically; there is no reason why duck eggs should not be as mild-flavoured and as agreeable to the taste as pullet eggs of the first quality. The flavour of the egg depends almost entirely upon the food eaten by the bird which produced it, whether that bird be hen or duck; and when the latter is provided with sound food, when in fact she is given a similar diet to that which is prepared for a laying hen, there will be nothing strong about the flavour of her eggs.

So much is well known to those who specialize in "egg" ducks; hence the pity is that so many people who keep stock for the production of table ducklings —and market the eggs when that trade is over for the season—do not appear to realize that such birds and those whose eggs are for human consumption require entirely different treatment. Ducks which range land where they can and do find food which, in the nature of things, cannot do other than add "flavour" to their eggs, produce strong eggs for hatching, but eggs which are far too strong to be marketed as new-laid. Ducks have frequently been referred to as the garbage gleaners of the farm; but, although they are no doubt useful for such a purpose if that be the sole object of keeping them, those which are required to produce sound edible eggs must have proper quarters and be well fed, and this applies even when they are given free range of a perfectly natural feeding ground. Feeding, in fact, is the most important part of their management. So many duck-keepers have failed to get the best results from their birds, well-bred laying stock, because they have not understood the feeding of them. That ducks can be kept profitably for egg production, I am fully convinced from my own experience with them; but I keep them as a side-line and should never attempt to farm such birds, chiefly on account of the great difficulty there is in disposing of their eggs in large quantities.

There was a time when, during the scarce season of autumn and winter, first-quality duck eggs realized as much as sixpence a dozen more than hen eggs; and yet I have been into districts recently where they could be purchased, retail, at less than pullet eggs, while never to my recollection during the past year or so have I seen them offered for sale at a higher price than hen eggs. In my own case, for instance, on the rare occasions on which there were a few for disposal to the wholesaler, they realized the same prices as our other eggs; but, considering that the smallest of them scaled $2\frac{3}{4}$ oz. it was not an altogether satisfactory return for the producer, for the simple reason that a duck requires almost 50 per cent more food, taking the year through, than a hen, if both birds are being kept for high egg production. That being so, then it may well be asked, wherein lies their profit? I must admit there is little margin for profit under such conditions; and were it not for the fact that the expenditure on accommodation is much less than for hens, while the flock average of egg production is higher with ducks, that small margin would not exist.

As it is, consumers who can be assured of getting eggs of first-class quality, marketed in a perfectly fresh and clean condition, will generally become regular customers; and it is such buyers that the keeper of laying ducks has to seek out—and to keep. Of course, now that foreign eggs have to be marked, and "eggs in shell laid by domestic ducks" are sold under a grade designation, there is more opportunity for British duck-keepers to increase the popularity of duck eggs. That the up-to-date post-war methods of feeding the birds on proper laying rations, similar to those given to hens, have resulted in the production of eggs which are mild-flavoured and of excellent quality, there is no doubt; and if the egg-eating public could only be induced at least to sample such eggs,

they might be persuaded into purchasing them regularly. Then the development of duck egg farms as a commercial proposition would be possible.

General Management of the Stock

Although it is common to see poultry of all kinds mingling together on the farmstead, it is not advisable to keep ducks with fowls, geese, or turkeys. Each species, if all are kept, should have its own quarters; and although this is difficult at times with fowls and turkeys, which wander so much, it is, nevertheless, possible when there are ducks and hens, whether the birds be for egg production or stock. This is necessary if merely because the former are waterfowl and the latter are, essentially, land birds, even though the laying breeds of duck are often referred to as "land" ducks. However, they differ in habits; consequently their management must differ.

Ducks can be kept successfully on almost any sort of land which is useless for hens, on a thoroughly swampy holding or that which is too damp for cattle or sheep grazing, since if the surface is soft and muddy it does not worry them. In fact, they appear to prefer it; and when permitted to wander at large they will select such a place rather than any other. When kept on good grassland, however, they can be relied on not to make holes in it, provided they have a bath in which they can wallow. Moreover, as long as the grass continues to grow well and is kept short on the place where the ducks run, there is little likelihood of disease resulting from the birds remaining too long on one patch of it; and in this direction I recall an old breeder of Aylesbury ducks at Chesham, Bucks, who had bred and reared on an average 2500 ducks each year on two acres of land for forty-five years without resting the ground, as he had his own breeding flock, which used a portion of it after the young ducks had been killed and marketed. However, where laying ducks have to be kept permanently on the same grassland, I should not advise more than 100 to an acre; and then they should be divided into flocks of fifty and given interchangeable runs.

An intensive house is certainly not fit accommodation for ducks as their sole "run"; and although for back-garden poultry-keepers it is doubtful whether they should be kept in preference to hens, owing to the difficulty of ensuring a small earth run being free from disagreeable odours in wet weather, it might be managed if the birds were confined to covered runs and well littered down with peat moss, which would have to be constantly turned. A flock of laying ducks, however, can be a useful asset to smallholders and general farmers, because when once the birds are fully feathered they thrive perfectly well with no other housing than just rough shelters, as long as they can sleep in a reasonably dry spot. But in any case they do not require elaborate houses, and the depreciation on housing is almost a negligible quantity. Hence the amount necessary for accommodating them, both as regards housing and land, enables a person to commence duck-keeping for a much smaller outlay than is the case with hens. That they are hardier than laying fowls is well known among those of us who have kept most kinds of domestic poultry, while it is certainly my experience that they are less subject to disease.

FIG. 245. READY FOR THEIR MEAL

A drake and his mates with some of their offspring. The adults are second-season birds, and the young ducks are maturing for the stock pens. These Ayleshurys were selected for the production of first-class market ducklings

They do not require the amount of care and attention which is so necessary with "cocks and hens" to make them lay, while the economic life of a laying duck is at least three seasons, which results in a considerable economy for replacements. Moreover, ducks are of such a peaceful nature that they can be allowed to range together in flocks of both sexes, except, of course, during the breeding season, when each particular strain of layers would be separated; but, even then, three or four drakes will live amicably together when penned for stock purposes. It may here be noted that when the birds are being run solely for egg production, a drake in a flock of ducks certainly keeps them quiet and more contented than when the females are forced to remain unmated; and his presence also helps towards a higher production. The only disadvantage is the cost of his food, although this can be more than offset if eggs are sold for hatching. The average duck-keeper may not wish to be bothered with selling sittings; and yet even one drake in the flock is advisable. I have frequently

noticed that, during the breeding season, drakes are apt to be quarrelsome with "outsiders," and at such times they have been known to injure fowls. Hence my advice always to keep ducks away from other stock.

Accommodation

Undoubtedly the first thing to consider, when it has been finally decided to go in for ducks, is the amount of accommodation there is at disposal; but when one's activities have to be confined to a small garden there is little choice, and perhaps in such circumstances it is better to give up the idea, unless the garden is not too near those of neighbours. At most, however, half a dozen layers would be the limit, as egg ducks do not require water on which to swim —nothing more than a bath in a large drinking vessel. It would not do to go in for stock birds in such a small place; admittedly, mated birds used often to be seen in town or city, and especially in stable yard or similar place, but the town duck has gone out since automobiles came in. In a suitable small garden, however, two or three batches of ducklings might be attempted for table, since the ideal conditions for rearing table ducks are not found in free range and access to swimming water, but in a small and somewhat secluded run with a snug and dry sleeping house. Many of the choicest ducklings for the early markets are so reared annually, in small lots, in more than one village and hamlet in this country. Of course, poultry-keepers who have plenty of land at their disposal can go in for ducks in all branches—for table, laying or even exhibition—and deal in eggs for hatching, day-old ducklings, young ducks for laying, and drakes for stock.

FIG. 246. A SHADY SPOT

Part of a stream, which runs through a wood, has been fenced off and included in the birds' range. It makes ideal water for ducks

The nature of the soil, as I have already remarked, is not of very great importance, although the best is gravel and the worst clay, but sandy or light loam will do. If there is natural shade it is a decided advantage, because ducks always seek sheltered quarters, and shade of some sort is essential in summer, as well as during the rearing season, especially if swimming water is not available—ducklings which have to be continually exposed to the full glare of the sun during the midday hours will soon turn up their toes. As regards the sleeping quarters, I provide my ducks with a dry lie down; and where they are not too fully exposed to winds. They will remain healthy if left out at night to sleep under bush or tree, or on the waterside all through the year; but it is preferable to house them so as to keep them safe from all enemies, and so that the whole of their eggs can be secured.

When egg production during winter is the object, I like to house the young birds which are coming into lay for the first time, if merely to accustom them to nesting in an easily accessible place. I have kept ducks in various kinds of houses, ranging from a barn to a barrel—a hogshead, and not merely the standard 36-gallon one. However, when a house has to be made it need not be more than 3 ft. to 4 ft. high in front and 2 ft. to 3 ft. at the back, as long as all parts of the floor can be reached by the attendant; but since young ducks are apt to suffer considerably from the heat, a very low-pitched roof is a disadvantage in summer, although throughout hot weather few birds willingly sleep in such night quarters and prefer the open air.

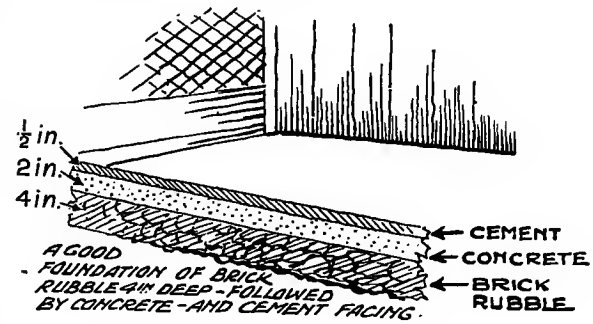


FIG. 247. THE DUCK HOUSE FLOOR

The floor of the permanent house for stock birds should be such that it can be kept clean; and one similar to the above will prove beneficial. The litter (straw) can be shaken up each morning and renewed when necessary, the floor being swilled over before fresh stuff is put down

A Suitable House

For a small pen of ducks, say half a dozen layers, a house 3 ft. square (ground space) will be ample; for adult stock an average allowance of 1½ sq. ft. a head

of sleeping room will prevent overcrowding. I have kept a drake and four ducks in a shed with only 5 sq. ft. of floor space; but the birds want sufficient room to enable them to get away from the front. In any case ducks nearly always cuddle up together when they are sleeping, even when they are allowed double the amount of floor space mentioned. As to the model, it can be span roofed or lean-to—the latter being the easier to make—the bottom half of the front being of wood, and the top fitted with wire-netting and having a board fixed along the top to prevent rain door must be wide open; and even when laying ducks are being trap-nested, the nest itself must not have a trap—ducks like to see where they are going to bed down. They will probably scatter the litter when leaving the house; but one must put up with it. A "lip" might keep things tidy; but ducks are not hens, to nip lightly over such an obstruction, because they will blunder over and may thereby dislocate a leg or injure themselves in some other way. The only fitments for such a house are a few bricks arranged in one corner on the floor for a nesting place, or the litter

FIG. 248. KHAKI CAMPBELLS

The Khaki Campbell duck vies with the Indian Runner for egg production, and some of the best laying ducks at the Tests have been birds of this breed

being driven in to soak the litter, because ducks must have a dry bed. The floor should be of such a nature as to keep rats out, and be well covered with straw, cavings, or similar litter.

One half of the solid front can be hinged at the bottom to act as the door, to open outwards and downwards; or divided, and hung similar to coach house doors, to open widely and to lie flat against each end of the front. Some duck house doors are made to slide; but the lower groove generally gets filled with litter, which causes trouble. No house for more than one duck should be fitted with a "pop-hole" or the usual small trap-door seen in hen roosts, because while ducks may troop solemnly over a meadow in Indian file when going to or coming from the water, they will not enter or leave their sleeping quarters in such a fashion—they do it in mass formation. The beaten down to form a hollow. However much the birds foul the floor they rarely sleep in the nest or near it. Some poultry-keepers put a nest egg in, but I have not found it necessary. If the ducks have to be closed in at night a pan of drinking water should be handy for them.

A Permanent Run

Unless they are kept to a small run, it is advisable to fence off a few feet in front of the house to which they could be confined until about 10 a.m. during the first few days they come into lay, to get them accustomed to the nest, as some ducks lay while they are on the water, and eggs so deposited are difficult to recover. The enclosure can consist of 3 in. mesh wire-netting, 2 ft. high, as few ducks will get over such a fence. During frosty weather the enclosure might be

littered with bracken or straw, not simply to keep the ducks off the cold floor while they are standing about, but to prevent breakages if eggs are dropped on the ground. Perhaps one of the greatest economies in the keeping of ducks is that, as a rule, there is no need to provide them with a succession of houses for the different stages of growth, as is the case with chickens. The small stock-pen house just mentioned will do for

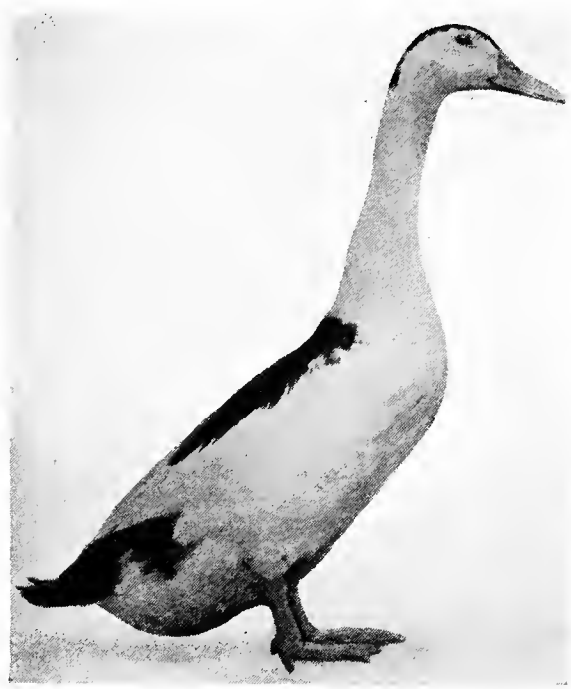


FIG. 249. A MAGPIE DRAKE

A prize-winning bird of this somewhat recent breed of waterfowl. Magpie ducks are generally considered as good layers

a clutch of ducklings from the shell; in fact, a broody hen could be set in one, and the birds allowed to occupy it for "good and all."

A few words more on the general management of laying ducks. Nothing should be done to worry or frighten the birds. They are rather nervous creatures, until they have matured, and domestication for almost countless years has not made them altogether tame, especially young birds of the light breeds which have been ranged and are coming into lay, and ducklings which are being fattened. Sudden noises are apt to worry them, while they are sensitive at the approach of dogs or cats unless accustomed to them from early days. Rats they dislike, but a fox will play havoc among them; in fact Reynard upsets them as much as a rat terrifies a turkey or a mouse an elephant. I once saw the effect of a fox which had visited a neighbour's duck sheds; and I could scarcely credit the devastation which had been made among old and young alike. It impressed me with the importance of making all secure.

Breeds for Egg Production

Since the egg duck has become recognized as worthy of attention, and the Duck Laying Tests have caused the poultry-keeping public to take an interest in performances, two or three breeds have been singled out as capable of putting up remarkable records. At least it is so with the Indian Runner and the Khaki Campbell, which undoubtedly head the list; but there are others of the laying kinds, such as Abacot Rangers, Bali (similar to Indian Runners, but with a crest), Coaley Fawns, and Black East Indian, which, nevertheless, are not so popular. In a measure, too, Orpingtons, Magpies, Baldwins, Stanbridge Whites, Cayugas, Penguins, Pekins, and Rouen are more or less layers; and although scarcely of as light a build as those just mentioned, they are capable of producing

FIG. 250. A BUFF ORPINGTON DUCK

Although this bird is a prize-winner, the Orpington breed of duck is a very serviceable one for general purposes, the females being good layers, and the young drakes suitable for most markets

satisfactory results for the average duck-keeper. There can be no doubt, however, that when the greatest numbers of eggs are required Indian Runners or Khaki Campbell ducks would be chosen; but, as with hens, it is a question of selecting a strain or family of the breed rather than any bird so named. The Buff Orpington duck is also a dependable egg

producer, but rather of the general-purpose than the super laying type.

There is only one variety of the Khaki Campbell, since the standard colour of this breed is "an even shade of warm khaki or dark buff," but of Indian Runners there are several, among them being Black,

FIG. 251. AN INDIAN RUNNER DUCK

A fine show specimen of the Fawn variety of this quaint breed, which, in outline, resembles the old soda-water bottle. The breed is a runner, since it does not waddle

Chocolate, Fawn, Fawn and White, and White. The peculiar characteristic of this latter breed is that the birds carry their heads remarkably erect, the body in outline resembling the old style of soda water bottle, upright, while the natural pace of the Runner is a straight-out run (hence its name), not the usual waddle or walk common to most ducks. Practically the whole of the laying breeds of ducks produce white-shelled eggs, and only the Black East Indian and the Cayuga lay those of the familiar dark green colour. Duck-breeders have made a special point of shell colour, probably because white is considered to make a greater appeal than green to the public; and if that be so, it seems a pity that someone cannot introduce a breed of duck whose eggs shall be rich brown. However, in the south and west of England, at least, the white egg seems to be preferable to the green.

Suitable Diets

Whichever breed the beginner selects for egg production, I advise him to start with it simply as a side-line, so as to work up a private trade for the eggs, because their sale is limited in most cases. I have already said that a heavy laying duck requires about 50 per cent more food than a high-producing hen for a full year's egg yield. This means that, as a whole, duck eggs are more costly to produce; so unless one can get a price for them which will compensate for the extra cost of feeding, it would be folly to go in for egg ducks on a large scale. The only time that such birds pay well is during the autumn and early winter, since throughout the intermediate periods they show practically no profit, if they have to be provided with all the food they require.

In the experiment already referred to it was shown that, in spite of the birds being kept on perfectly natural feeding grounds, in order to get more than 200 eggs a head per annum, "each duck must receive at least an average of 5½ oz. of concentrated food *per diem* throughout the year." This was proved by reducing the daily allowance from 6½ oz. to 6 oz. in mid-winter, when the birds were in full lay, which caused a falling off of over 10 per cent in production, although the output of eggs returned to normal when the extra ½ oz. was again given, while during a very cold spell it was found essential to provide the flock with an additional quantity of meal, bringing the total to 7 oz. (dry weight) a head *per diem*.

In the same way, in the spring months, to drop the quantity below 4½ oz. resulted in a 15 per cent reduction of the output, which, however, was again made good when an additional ounce of food *per diem* was allowed. It will thus be seen that, in order to get a large winter supply of eggs, it is essential to feed the birds heavily with a somewhat concentrated ration, irrespective of any natural food they may obtain. When the ducks in that experiment were on free range they received, from March to the beginning of October, one meal *per diem* only, given at 7 p.m. and left before them to finish at will during the night. It was composed of 50 per cent fine middlings, 35 per cent flaked maize and 15 per cent fish meal, the maize not being steeped or soaked in hot water, but just mixed with the other ingredients. Water was added

until a light friable mash was obtained, the quantity working out at 5½ oz. dry weight for each bird. From October to the end of March the mash was altered to 45 per cent flaked maize, 35 per cent fine middlings, and 20 per cent best fish meal; and at least 6 oz. (dry weight) a head was allowed, with an extra ounce of flaked maize during a very cold spell. In addition to this food it was found to be absolutely essential to keep always before the ducks a good quantity of oyster shell grit, of which they ate large quantities. The Duck Laying Tests have amply demonstrated that birds which are bred for laying produce freely during the late autumn and winter months, while rough and cold weather has little effect on the output of eggs, provided the ducks are adequately fed.

It is this winter supply of eggs for which the beginner should strive; but let him conduct his operations along small lines, and increase only as he is assured of a good private trade. To make egg ducks at all profitable on a large scale they must be kept where they can find a great deal of natural food during the spring and summer months. However, as the novice is not likely to have such feeding ground at his disposal, he should confine his duck-keeping to half a dozen good birds of the Indian Runner or Khaki Campbell type to produce eggs for his household—if the "house" does not object to duck eggs. The kitchen scraps which he will probably be able to collect will help him considerably to keep the cost of food low enough without adversely affecting production. He may perhaps then find it better to keep ducks than hens, because it is possible to get from such small numbers of birds practically one egg a head *per diem* during autumn and winter, while I have heard of some who have almost reached the 300 per annum mark. The question of marketing the eggs at adequate prices is the important point; hence if he cannot find a market, then I advise him to turn to hens, because, of a truth, hen eggs sell themselves.

Trap-nesting

One thing to note regarding egg ducks is that it is not advisable to change them to fresh quarters when they are settling down to lay. As a matter of fact, if they are going to be trap-nested, they should be trained to the traps some time before they are due to commence laying—when they are four to five months old—and not merely started on that system when they have produced their first egg; because in both of these cases it is more than likely to put the birds off lay for some weeks, or even to send them into a moult. It is also most advisable, when allowing ducks alternate runs, as suggested in the case of keeping 100 birds to the acre, to let them have the use of both runs —they adjoin each other—for a few days prior to confining them to the fresh one.

When they become accustomed to their own sleeping and laying quarters they may be safely allowed to mingle with other flocks of ducks during the day, because they can be trusted to return home to their own house in the evening. Moreover, if breeding stock is being kept, the birds should be mated two or three months beforehand, so as to allow the pen plenty of time in which to settle down before the season starts. They "have their ways," have ducks; but, although we keep fowls, geese, turkeys, bantams, and a few pigeons as well on my farm, and I have been among poultry these many years, I think that stock ducks are about the most sensible and amicable creatures in feathers with which a poultry-farmer has to deal. If only the public would appreciate their eggs—but they appreciate their young, which gives duck owners something to do.

Young ducks for autumn laying need not be hatched until March; in fact if they are out much before that month they will probably commence laying in summer, produce a small batch of eggs and then go into a moult or rest off until spring. Ducks which are bred for high production, provided they are from well-matured and vigorous stock, feather up very quickly; and I have known of Khaki Campbell ducks which were hatched in April to begin laying in September, although such a youthful start, I am told, is the rule rather than the exception these days with laying strains. And there are plenty of reliable strains of high-producing birds now that the trap-nesting of ducks is understood. Probably few novices would trap-nest their stock, but it is as essential when one is specializing in the breeding of egg ducks as in the breeding of laying hens. These two kinds of traps, however, differ considerably, because, except the Muscovy, ducks do not perch and they would certainly not fly up to a perch to reach a trap-nest.

The trap-nest in this case is on the ground; and the arrangement of single pens ensures each duck having her own compartment in which she can sleep and lay. As a rule these trap-nest houses consist of a row of coops or sitting boxes with open fronts, and attached to them a range of small wire-netting runs; and thus, as the ducks leave their range and pass into the traps, each bird has a run and shelter to herself, where she is kept until her egg is checked up the following morning. These trap-nest houses can be of simple construction; but since ducks do not like changes they must be trained to the traps a month or more before they are due to lay. This is not a difficult matter on one's own place; in fact the usual duck house can be utilized, if nest boxes are fitted and a little trouble is taken to see that each bird

occupies one at night instead of sleeping on the floor. Covered nests with doors in front and wire-netting floors will do; but the attendant must be up early to liberate the ducks, which is not so essential when each trap-nest has a small run attached to it. Trap-nesting is an excellent way of taming the birds, because they are frequently handled; and the well-trained duck is always the better layer.

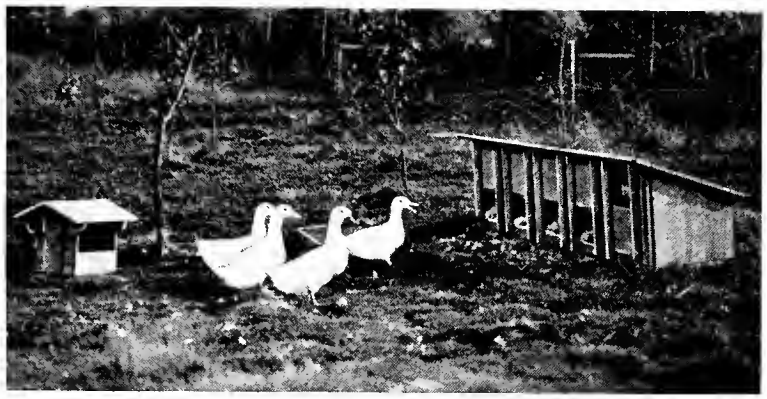


FIG. 252. TRAP-NESTS FOR DUCKS

Outside trap-nests for ducks, each consisting of a cosy little hutch. The birds are White Campbells, which origioated in white sports from Khakis

Mating and Breeding

I have already mentioned that the breeding stock should be mated two or three months before the season starts; and for layers this will mean putting the pens together at the latest by Christmas, because sometimes ducks do not take kindly to drakes when first introduced to the pen. It will not be too early to let them run together in October, as it will allow the birds ample time in which to settle down before fertile eggs are required, and to give their owner the opportunity of observing whether the drake is shaping well and whether by any chance the ducks have taken a permanent dislike to him. To introduce a young drake suddenly among a flock of ducks frequently produces anything but the desired effect; but if left for a week or two together the ducks eventually become accustomed to the stranger and the pen settles down.

As to the number of birds to run together, single pens can consist of a drake and six to ten ducks of the light breeds which, of course, are being considered for egg production. For small flocks two drakes to twenty ducks should be the proportion, although a couple of vigorous young drakes will give good results when mated with as many as fifty ducks. The drakes should be spring hatched and fully developed; and I prefer those which, by the end of the year, are at least nine months old. It seldom answers, however, to keep drakes for stock purposes running together without females after they have reached sexual maturity, so the earlier they are mated the better; and when drakes have to be bought in, they should be obtained early in autumn. The ducks should be second-season birds.

Ducks of the laying breeds do not sit, and even those of the other kinds which become broody are seldom good mothers. As a rule, when operations are on a small scale, hatching and rearing are done by hens in the usual way, each having nine or ten eggs—the period of incubation is twenty-seven to thirty days. The eggs require plenty of moisture; hence they should be sprinkled with warm water, for the last ten days or more, when the hen is off feeding. The nest should be made of hay, rather deep, while no more eggs should be put in than can be thoroughly covered by the sitting hen. Duck eggs, of course, can be incubated artificially and the ducklings brought up, also, by artificial means, while the birds can be battery-brooded for the first seven to ten days and then transferred to a canopy brooder for fourteen days, all the time being on wire floors, and in the latter case the brooder house having verandas, as described in Chapter VI; or they can be ground-reared, artificially, from the shell. Some duckers hatch by hens and rear the birds in brooders; but the best duck fatteners of the old days, as many of them do now, hatch and rear by hens.

Rearing and Feeding Ducklings

When a hen has charge of the ducklings—they seldom require brooding after a month—they should be transferred to a spacious coop of the double compartment kind, and brought along like chickens—and like the best chickens, too. I prefer to give them wet mash at first; biscuit meal, Sussex-ground oats, or similar food is not too good for them. They can commence feeding when they are thirty-six hours old, from that time until the end of a week getting biscuit meal well soaked and made into a damp but not sloppy mash with Sussex-ground oats and best middlings. Start them well and they will give little, if any, trouble. Keep drinking water before them, in a particularly shallow dish, and with shell and small gravel at the bottom; they should not be encouraged to swim in it, although they will attempt to do so as

soon as they are a few days old. The water dish should be well within reach of the hen; and never let it get dry. Litter the coop liberally with chopped straw.

If they have not the advantage of a grass plot, they will appreciate fresh young green food, finely chopped and put into the drinking pan once daily. If the wet mash is prepared with boiled skim milk at first they will not require any other form of animal protein. They should have four or five good meals daily until they are a month old, the first being put down early in the morning, and the last meal given to them at night as late as possible. At the end of a week the biscuit meal and Sussex-ground oats should be gradually reduced and flaked maize or maize meal and barley meal introduced, while a good brand of meat meal or white fish meal can be mixed in, but not more than about 5 per cent to begin with, gradually increasing it as they get accustomed to it.

By the time the ducklings are a month old their mash can consist of five parts (by measure, not weight) of best middlings, two parts each of maize meal (or flaked maize) and barley meal, and one part of animal protein—fine greaves, granulated meat, meat meal, or white fish meal. The last-named is the best as a rule since it is of standard make; it must not contain more than 4 per cent of oil or salt, although one can generally depend on any good brand. Care must be taken if greaves are used; only the finest quality should be obtained, and it should be boiled and simmered for about five hours. Proprietary fish and meat meals, however, are handier and preferable, but almost any meat scraps, boiled and minced, will also be found beneficial. From a month to six weeks old the number of meals should be gradually reduced to three *per diem*, as the birds will be making full use of their run long before then. At this age, too, they can be brought on to grain, beginning with coarse oatmeal sprinkled on the water; afterwards putting wheat and kibbled maize into the shallow water trough. They will have to get used to it, hence only a very small quantity need be put down at first; but if it be in the trough with the grit and shell—which, for ducks, are put into water—they will gradually acquire the taste for it. A pan of drinking water should be placed in the coop after the ducklings are made secure for the night.

Birds which are battery-reared are given damp mash; and the following is recommended by those who adopt this system, the percentages being by weight: Fine middlings 40 per cent, home-milled bran 20 per cent, maize meal and Sussex-ground oats 10 per cent each, extracted soya bean meal, dried yeast, and dried skim milk 5 per cent each, mineral mixture and cod-liver oil 2½ per cent each. This mash is continued with such ducklings as long as they are being reared on wire floors, it being essential to see that drinking water is always available. When they are off brooder heat, they can be brought along in the usual way. I have not yet attempted the battery system for ducklings, since the birds we handle are chiefly for market purposes, and hens are found suitable for the numbers dealt with, while mass rearing methods for those which are required for stock do not appeal to me.

Separating the Sexes

The sexes should be separated as soon as possible—ducklings can be "sexed" when they are a few days old more easily than chicks at the day-old stage—although most duck-keepers who operate on a small scale do not part the "drakerels" from the "ducklets" until the birds are about eight weeks old, when the females are put into the quarters they will occupy for the remainder of their lives. It is quite easy to distinguish the ducks from the drakes at such an age, because, although the males have not, of course, grown the curled feathers of their tails, they have, at any rate, found their voices. By holding the bird gently off the ground by its neck it is almost bound to use its voice in its struggle to get free; the female quacks distinctly, but the young drake emits merely a hoarse hiss or croak—ducks (females) are always the "quackers."

Some important matters to note in the direction of housing may be mentioned. If the ducklings have been pen-reared and are transferred to free or open range, they must not be given full liberty until they are thoroughly accustomed to their fresh quarters. This means that part of the land adjoining their house should be wired off for a week or more, and the birds confined to it and fed there; 2 ft. high wire-netting pegged down and kept in place with half a dozen or more bamboos will make a suitable temporary fence. Also, for the first few days they are given their freedom a full meal of mash should be put down for them at midday and the wire not removed until an hour or so afterwards. It is advisable to accustom them to being shut in their house at night when they are eventually permitted free range, gently driving them in at dusk, as it does much to get them over their nervousness and to enable them to be well settled down when the laying season commences. Once they are used to sleeping under a roof they may be safely allowed to return "home" of their own accord, provided always their range is free of foxes. Ducks frequently find much natural food long after sundown—and before sunrise, too, when they are allowed to forage. But, in any case, their attendant should always see that they are safe for the night if they are using an open range.

Feeding Layers

When ducklings are about ten to twelve weeks old, and are being reared for future egg production, not for market, they will require a little extra attention, since it is then that they generally begin their change of plumage, and are particularly nervous, even of their regular attendant. Hence nothing should be done that is likely to scare them; they should be left alone as much as possible. When they are fed—and they must be well fed—it should be done quietly; but at such a period I do little in the way of shaking up their litter, giving their houses plenty of it to last for three or four weeks.

FIG. 253. RETURNING FROM RANGE

Ten Aylesbury ducks—including a drake—arriving home after a spell on the pond and at range. Well-managed stock birds can be relied on to return to their house in orderly fashion without any driving

As soon as they furnish up again they will return to normal; and from then onwards, until about mid-August they should be kept on the lean and hard side rather than fat, although growing ducklings of the laying breeds can stand fairly full feeding all through. However, unless the weather is particularly dry and hot, and they have the range of field or orchard, a light meal of grain for breakfast—chiefly wheat, or with a small percentage of kibbled maize added—and mash made of potatoes or other "roots" and vegetables, boiled and minced, and mixed up with barley meal and middlings, will probably be ample for them. They do not want more than two meals daily. The grain should always be put into water, not only because ducks can eat it much easier from a trough than from the ground—they cannot scratch it about and pick it up like hens—but if they leave any, it will not be cleared by starlings, finches, sparrows, or similar thieves, and they can then finish the grain when they return.

From the middle of August their food should be increased and full laying rations be in force by September. This food can consist of mash only, as mentioned in connexion with the large flock experiment, a quarter of the quantity some time in the morning and the bulk of it just before they are shut up; such a method as this, viz. allowing 75 per cent of the food as the last meal, and placing it so that the birds can eat it as they like during the night, is an excellent way of ensuring high production during the short days of the winter months. On the other hand, they may be allowed about 3 oz. a head of grain for breakfast, and 4 oz. (dry weight) of layers' wet mash in the afternoon; and always plenty of drinking water, grit, and shell.

Some feeders substitute barley meal or maize meal for flaked maize, and fine greaves, meat-and-bone meal, or meat meal for fish meal; but the flakes and the fish meal are rather preferable, the former to prevent the mash being stodgy, and because it is partly cooked and of a standard quality, and white fish meal because it does not fatten the birds, while it certainly does not impart a fish flavour to the eggs. However, no matter which mixture is chosen for the

mash, keep to it right through, unless perchance it is found to be quite unsuitable. It does no good to keep chopping and changing the food of ducks which are laying. When two meals *per diem* are allowed, it is as well to supply them to the birds at the same hours daily throughout the whole period; hence breakfast at 9 a.m. and tea at 3 p.m. has been found suitable for many feeders. The ducks will be out long before such an hour from spring onwards, and ranging also in the evening; but whether they be on the pond for a morning bath, or sheltering from the sun in the afternoon, they will be on hand at the set meal times, and ready to eat.

Cleaning the Eggs

During winter, and at other times also, duck eggs are apt to get dirty; and since they must not be marketed in such a state they must be cleaned. As a rule, this can be done by standing them in cold water for half an hour and rubbing them briskly with a cloth. Otherwise, the following method of preparing them for sale should be adopted; and it will also be found serviceable for any reader who exhibits duck eggs, as classes are sometimes provided for them at poultry shows: Into a gallon of water pour 1 oz. of sulphuric acid. A medicine glass should be used, and great care must be exercised, as the acid in its neat state will burn one's skin. Place the eggs to be cleaned in a bucket and pour the acid solution over them so that they are just covered; and leave them in the solution for fifteen minutes. Then remove them, wipe with a piece of flannel, dip them into warm water (so as to remove any acid) and allow them to dry on a slatted tray covered with paper. The points to remember are not to make the solution too strong, that is, be very careful in measuring out the exact quantity of the acid; always pour the acid into the water, not the reverse; do not use hot water; and never try to clean thin or rough-shelled eggs.

I have said that there is not a great demand for British duck eggs; but if a combined effort were made by the thousands of people who do keep laying breeds of ducks to advertise the virtues of new-laid home-produced duck eggs, the public would probably purchase them as readily as they buy new-laid hen eggs. No egg is more nutritious than that laid by a properly fed duck.

Ducklings for Market

The table duck industry of England and Wales has been a very considerable one for many years; and although ducks are fairly evenly distributed throughout the country, the largest supplies of ducklings are obtained from about ten counties. In some, the trade is confined to the production of early birds, while in others there is a steady demand practically all through the year, and in the North especially during summer and early autumn for the holiday resorts. Duck fatteners turn out as many as 70,000 birds in a year from one establishment, while quantities of 12,000 to 20,000 are quite common. The rearing of table ducklings is probably one of the most intensive forms of cultivation existing, since, owing to the fact that it is more or less a seasonal trade, there is a considerable period of the year when the ground upon which they have been raised can be rested and so recover its condition. The result is that an acre of land will be sufficient on which to bring up several thousand ducklings year after year without its becoming too foul for the purpose.

There are many large duck farms in Lancashire and Cheshire, but the class of duckling produced in those counties is not suitable for the London markets, although finding a ready sale in the northern seaside resorts. In Norfolk and Suffolk, also, immense quantities of ducklings are to be seen on the fattening farms during May, June, and July, in some localities the flocks being divided into lots of 2000 to 3000, according to the age and size of the birds, and being maintained in fields and on pools. At the age of eight to ten weeks the ducklings are fat enough to be killed, and the best quality birds scale, when plucked, from 4 lb. to 5 lb. each.

At one time, the largest quantity and best quality of ducklings were produced in Buckinghamshire, but the trade in that county is not as large as it used to be, although there are still a few men who rear the finest ducklings in England and cater solely for the very pick of the London markets. These genuine Aylesbury ducklings remain unbeaten for size and quality; and birds from commercial stock scale up to 7 lb. each at eight to nine weeks and have been known to realize as much as 14s. apiece in the early part of the season. But they are suffering, like every other branch of the table poultry trade—fowls, geese, and turkeys—by the present-day craze for "small joints." Excellent ducks of the "Buckinghamshire White" or Aylesbury type of bird are reared in Bedfordshire and Devonshire, while Cornwall and Hertfordshire are also good duck centres.

The Aylesbury Type

Until recently, such stock was raised by cottagers and smallholders, who used broody hens; and the ducklings were sold to the fatteners at ages varying from about fourteen days to five or six weeks. But in many parts of the country to-day, owing to the changes which are ever taking place, breeding stock is kept on the duck farms, and hatching and rearing are carried out on a large scale by artificial means, in

some instances battery brooders being employed. In fact, one of the most enterprising rearers of table ducklings in Buckinghamshire recently told me he finds that rearing such birds in this new form of apparatus is less difficult than rearing chickens, and that it is remarkable how quickly ducklings become hardened in the battery brooders, and what excellent development they make compared with chickens, when one sees the two reared side by side under the same conditions. But since he runs the temperatures of his batteries at 82° F. at the start and 75° F. at the end of a week for ducklings, I am not surprised to hear that his chickens reared in such heat become soft and lose their powers of resistance to disease.

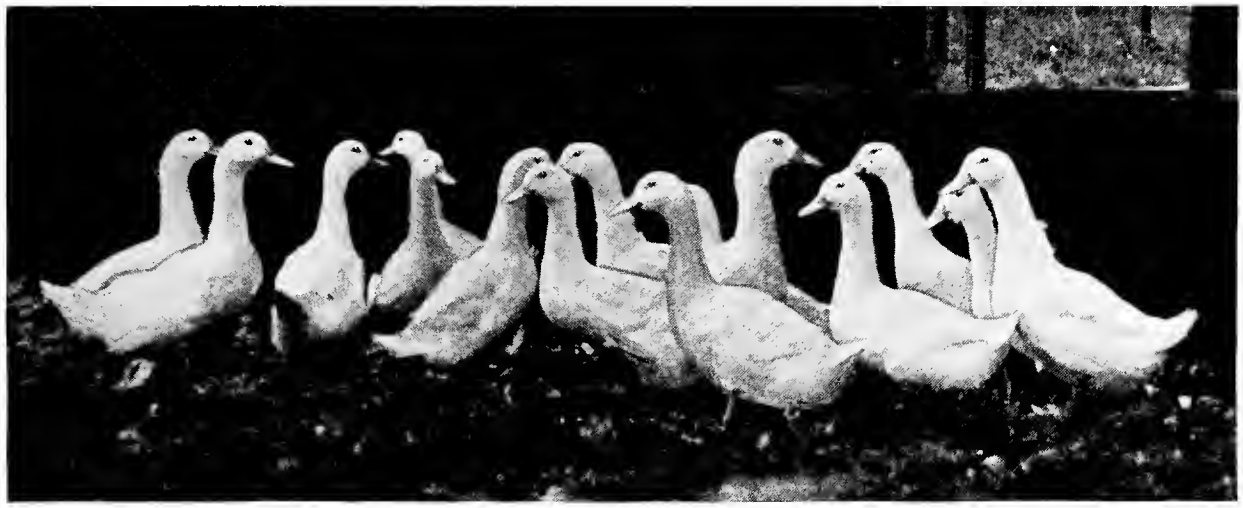


FIG. 254. UTILITY AYLESBURYS

Young ducks of the Aylesbury breed—the white ducks of Buckinghamshire, which have been famous for many years on the London markets

However, on some of the large duck establishments the breeding stock is mated in August, the birds being run in small pens, an average mating being twenty ducks and five to seven drakes. Nothing elaborate is provided in the way of houses, but just sufficient to protect the stock from wind, rain and frost, the birds being bedded down on rough hay and straw, especially in the winter months. They are fed twice daily, the rations being 2 oz. a head of mixed wheat and kibbled maize for breakfast, and 4 oz. (dry weight) of wet mash for each bird in the afternoon, with unlimited supplies of oyster shell and drinking water, if ponds or streams are not available. The ducks are hatched in May to commence laying about Christmas, and the early January eggs are considered the most valuable. It is certainly so if Aylesburys are being kept, because it enables one to get the ducklings on to the market towards the end of March or the commencement of April, when they make good money.

With the vast quantities of table ducklings which are dealt with annually in this country, it might be thought that the production side is being overdone; but there still remains plenty of scope for industrious and energetic people to make the production of high-class ducklings a profitable side-line, while, in my opinion, there is even a greater scope for the production of summer ducklings at a popular price for holiday seekers who visit the seaside resorts along the southern and western coasts during August and September. This holiday duckling trade has many advantages over the spring and early summer trade—for which only the best quality ducklings fetch high prices—because mid-April is quite early enough to set eggs for providing ducklings to be marketed in August, while consumers of ducklings in late summer are not so particular as to the class of bird provided—they do not require the large Aylesbury duckling which is in demand for the very best market. There are also other openings for the disposal of young ducks, because in many a country district and riverside resort a good trade can be worked up with hotels and restaurants; and an energetic poultry-keeper who is keen on the sales side of his business might develop a decidedly profitable side-line with ducks.

Choosing a Suitable Breed

Just as there are certain breeds of duck suitable for egg production so there are those which are kept for table purposes rather than laying, although lay they must, and reasonably early, if one is catering for the best markets. This does not apply solely to the London trade, because in my own case, for instance,

late spring-hatched ducklings are scarcely worth rearing except for a private trade; and none of the birds goes to London. In the matter of breeds, however, some care will have to be exercised when selecting the stock since, generally speaking, white ducklings are required; and when the demand is for fairly large and fat ducks, there is no breed which compares with the commercial Aylesbury, the true "Buckinghamshire White." This stamp of duck is quite distinct from the exhibition type, which latter almost resembles an Embden goose in size and weight. Hence the importance of selecting for the stock pen ducks and drakes which have been bred solely for the production of market ducklings, if the object be to cater for such a somewhat limited trade.

In any case, nevertheless, where white ducklings do fetch the best prices, then the Aylesbury is, in my experience, the best to select. It is essential, however, that these Aylesburys be pure-bred birds and not those which have been crossed with some other breed of a light and more prolific kind, because, while first crosses do undoubtedly produce fertile eggs earlier in the season, their progeny lack the quality of the pure-bred birds and cannot be fattened to the requisite weights. It must be remembered that quality is the final test of a table bird; and although in the finished article it depends upon the fattener, it is impossible to put a good finish to an inferior type of duckling. Hence my suggestion that the pure-bred commercial Aylesbury is the breed for those who wish to cater for the best trade.

Another breed which is favoured in some quarters is the Pekin. It has size and weight, and can be plumped up rather earlier than the Aylesbury; but while some utility strains of it do possess white skin, the prevailing colour is yellow, and that prevents it being useful for the London market. However, Pekin ducks mated with an Aylesbury drake have produced some quite good marketable ducklings which scaled up to 12 lb. the couple at eight weeks. The Rouen is another heavy breed, somewhat resembling the common wild duck in colour of plumage; but, while it attains a good size, the flesh is not white, and the flavour is nearer that of the mallard than soft duck. It is certainly not one I recommend for the production of market ducklings, although decidedly useful, like pen-reared mallard, for those who like a game flavour in ducklings.

Some of the laying breeds are serviceable for the provincial or retail trade; and with them it is possible to work up a connexion among private customers —many people would appreciate a well-fed young drake for their Sunday dinner. In this direction an acquaintance finds no difficulty in disposing of his Khaki Campbell drakes as soon as they can fend for themselves, the purchasers rearing them for their own tables; and such a method of disposing of them is much better than preparing the drakes for sale in the

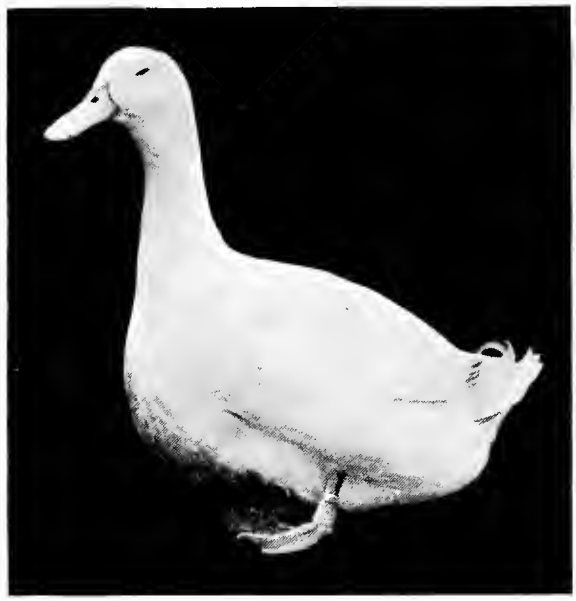


FIG. 255. AN AYLESBURY DRAKE

A splendid specimen of the exhibition Aylesbury. This bird was bred in Aylesbury, Bucks, by one of the most famous duck specialists in the world

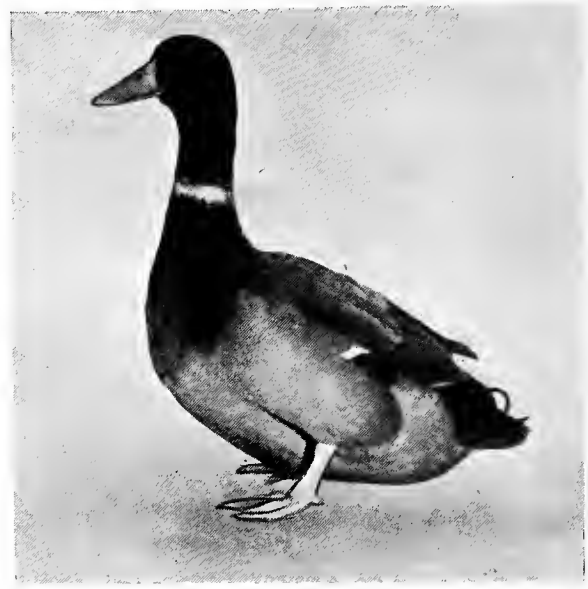


FIG. 256. A ROUEN DRAKE

This bird won first prize in keen competition at one of the Crystal Palace Poultry Shows. He comes well up to the standard demanded in this beautiful breed of duck

local market, where they do not realize enough to pay for their rearing.

For the summer holiday trade, for which purpose the eggs need not be set until mid-April, quick-growing cross-bred ducklings will be found suitable, since they are easy to hatch and rear, and meet with a ready sale as long as they are plump and not too small. Such crosses as Campbell-Aylesbury (from Aylesbury

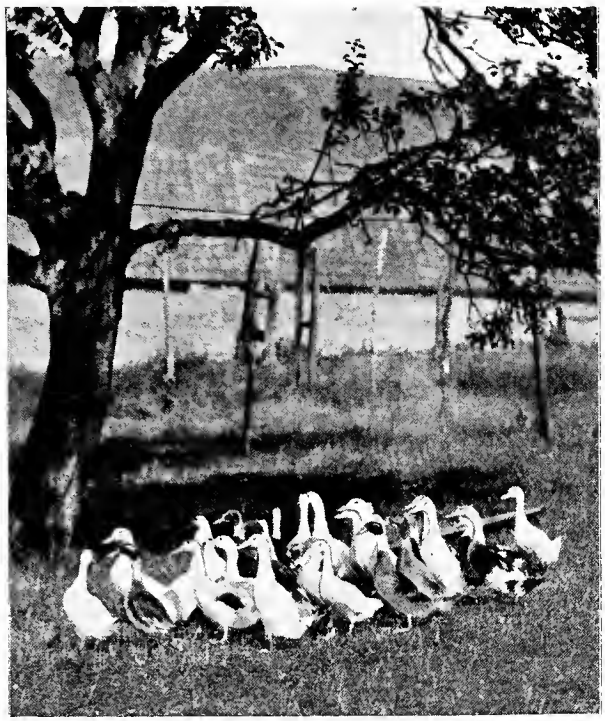


FIG. 257. COUNTRY DUCKS

These nine-week-old ducklings, of various breeds, have not been subjected to special fattening for the table. They are the kind one generally sees offered for sale as country ducks

ducks mated with Khaki Campbell drakes), Buff Orpington-Aylesbury, and White Indian Runner-Aylesbury are among the best; and if good sized ducks are chosen for the breeding pen, the progeny will be of satisfactory plumpness. These ducklings can be reared quite cheaply, because there is no necessity to feed them for killing at eight to nine weeks, as is the case with those for the spring trade. Hence, they can be brought along very satisfactorily on a wide range and by having bulky mash with plenty of vegetables.

The Breeding Stock

When mating stock for the production of table ducklings, Aylesburys for the early markets, the birds should be chosen from the same year's hatches, the drakes from March to April ducklings and the ducks from those hatched in May. Some breeders choose May-hatched drakes and June-hatched ducks, but the former may not be up to breeding pitch in time to fertilize the earliest eggs, while June ducks may not start until after the new year. Both drakes and ducks should be active and not of the unwieldy or lethargic kind, scaling around 8 lb. when matured, but the females heavier than the males. For such birds as Aylesburys the pen should consist of one drake and four ducks, or for other than single pens one drake for each five or six ducks. Early in the season twenty drakes will be required for a flock of 100 ducks; but the number of the male birds could be reduced in March, especially if the condition of the stock indicated that too many drakes were being used.

Good housing and feeding are essential points for the breeders. If the runs are not well sheltered it will be necessary to keep the stock in sheds during particularly cold weather, and to allow them out for only a short time on fine days in winter; to secure early eggs and a reasonable percentage of fertility such accommodation is necessary. At one time I considered it essential to provide the breeding stock with plenty of swimming exercise; but I am convinced that, when Aylesburys are being kept for winter production, the eggs are produced earlier in the season, and the fertility of them is better, if neither ducks nor drakes are allowed to use pond or stream, but are kept in sheltered grass enclosures and provided with stoutly made houses and plenty of litter.

The only "swim" my stock ducks get in the winter months is in their water trough; and they get drinking water with the chill off on cold mornings—as do the whole of the poultry here. Since adopting this method the results have been decidedly better. The feeding of the birds must be on the same lines as mentioned for egg ducks, except that from November the breeders get about 2 per cent of veterinary cod-liver oil, mixed in their mash daily at the rate of 1 quart with every hundredweight of dry food; and they are never kept short of fresh greens and shell grit. It is vastly different breeding from young ducks in winter and second-season ducks in spring or summer; the former can scarcely be overfed.

If the stock birds are reared at home they should be bred from second-season females, not young ducks, the progeny of the latter being reared for market only. When young drakes have to be purchased they should be secured not later than midsummer, so as to ensure their being about three or four months old and not of the previous year's hatching; but it is preferable to rear and keep one's own stock birds than to rely on bought ducklings, unless the seller is a breeder with a good reputation and is known to keep genuine Aylesburys, although first crosses may answer if the

best ducklings are not required. During the earliest part of the year, hatching should be done by hens; they may be difficult to secure, but when working on a small scale the earliest eggs have to be stored until there are sufficient to put down. I find that such eggs give better results when so hatched than when incubated by artificial means.

Hatching and Rearing

Some specialists put the eggs under hens for the first two weeks and finish hatching them in incubators, since their ducklings are raised artificially; but most "side-line" rearers of market birds do the complete hatching and rearing by hens. A dozen can be set on the same day; and the ducklings which are hatched can be given to two or three of the hens to rear—fertility and hatchability are not at the 100 per cent stage so early in the season, nothing like it, as a general rule. A large broody hen may safely be entrusted with as many as thirty ducklings when they are dried out, since they get sufficient warmth by packing together around her in a large coop in the brooder house. Consequently the hens which are not required for rearing will generally be content to continue sitting on fresh batches of eggs. This is doing double duty, admittedly; but it can generally be managed with steady old hens which are well fed and properly managed. Artificial incubation can take place later in the season, if necessary; but good hens will prove all that the beginner requires for the purpose. He can set them singly, although the rearing and fattening of small broods will cause a lot of extra labour.

On the other hand, professional duck rearers with whom I have come into contact—men who reckon on getting at least forty good market ducklings from each stock duck in the season—never rear the birds on mass lines, since, while they deal with hundreds at a time, the duckling sheds are sectioned by 1 ft. to 2 ft. high partitions, and the flocks seldom exceed 100, many of them being as low as fifty, and 1 sq. ft. a head of floor space is allowed as the minimum. This is when the ducklings are Aylesbury and the London market is their destination. In these cases, the birds are housed in long, low, and semi-dark sheds with suitable grass runs, to which they may be liberated three times *per diem*, when they are fed; and their beds are shaken up every morning. But one has to be well up to duckling rearing to handle large flocks successfully.

Beyond providing our ducklings with substantial lean-to houses or large coops and plenty of straw litter, they are penned off on grass and kept strictly to their own run. At no time are they allowed to range at large or to go on the water; and while they are with the hens they are either confined to a lean-to house or cooped in an orchard or on a well-sheltered plot of grass—which acts as a lawn at other times of the year. In this instance three or four large coops are wired off with 2 ft. high netting; but during the time the hens are doing duty—they are seldom required after a fortnight—each coop has a small wired-in run attached, over which sacks are placed during rain or excessive sun.

FIG. 258. AROUND THE WATER PAN

Ducklings being reared for the early market are kept in small grass runs and are not allowed to swim. However, they appreciate a shallow pan of water, in which they frequently paddle

Fattening Ducklings

The ducklings are well fed, and up to a month old they get the meals, etc., already mentioned in this chapter; but from that age onwards, maize meal is excluded, because it undoubtedly has a tendency to produce yellow fat, and thus to discolour the flesh and the skin. At the month-old stage, and up to seven weeks, the ducklings are given their fattening mash thrice regularly each day from troughs. No doubt Sussex-ground oats is the best fattening meal, but the present high price of it prevents its use in large quantities. The mash, therefore, is composed of four parts best middlings, three parts barley meal, and one part each Sussex-ground oats, meat meal, and fat, all parts being by strike measure and not weight. For about the first fortnight the meat meal is one and a half parts and the fat half a part; but the parts are gradually adjusted to one of each. The fat is obtained from the butcher, melted and run off into large enamel bowls; the meat meal is put into boiling water and kept simmering for several hours, and when it resembles soup it is mixed in with the meals and fat, and thus a wet but not sloppy mash is prepared.

There is much in the mixing; it has to be well done. When residing in Chesham years ago, I used to get an excellent quality of meat cake, locally made, which

was given instead of meat meal and fat. At times I have mixed boiled "pig" potatoes in the fattening mash as two parts along with barley meal; but it does not give such good results. None of our ducklings goes to London, but the buyer wants and pays well for good birds, which he gets from three or four of us in the neighbourhood. Another mixture suggested for fattening, which would doubtless be quite suitable where there is no objection to a yellow fat, is as follows: Maize meal four parts, wheat meal and middlings two parts of each, barley meal and greaves one part of each. The greaves would have to be of the quality known as fine, and well boiled and simmered before being used.

The ducklings are ready for killing when between eight and nine weeks old, or when their flights (the large wing feathers) are fully developed; and they must be killed then, otherwise they will go into a moult. It is often possible to keep them on for the full ten weeks during the early part of the year; but if the weather be at all mild they will probably commence to lose their first feathers at the end of the ninth week. It is essential to market them before this occurs, otherwise plucking will be a difficult matter; and removing the stubs, no matter how carefully it is done, leaves the skin with a rough and unfinished appearance. Aylesbury ducklings from good stock birds should average about 4½ lb.—ducks up to 4 lb., and drakes 1 lb. heavier. Better weights have been attained; but they are those for which the demand exists, and heavier birds are not required in my district.

Before being killed the ducklings should be kept without food for twelve hours; they should be killed by dislocation of the neck, and allowed partially to cool before being plucked. They do not require to be hung, but simply thrown on the straw as soon as the neck is broken. Contrary to what one might expect, this does not bruise the flesh, while the partial cooling allows the skin to get fairly set and thus prevents tearing in the plucking—and the plucking of ducklings is experts' work. The birds must be thoroughly cooled before they are packed; but since Aylesbury ducklings have their own shape, they should not be put into shaping troughs or pressed in any way.

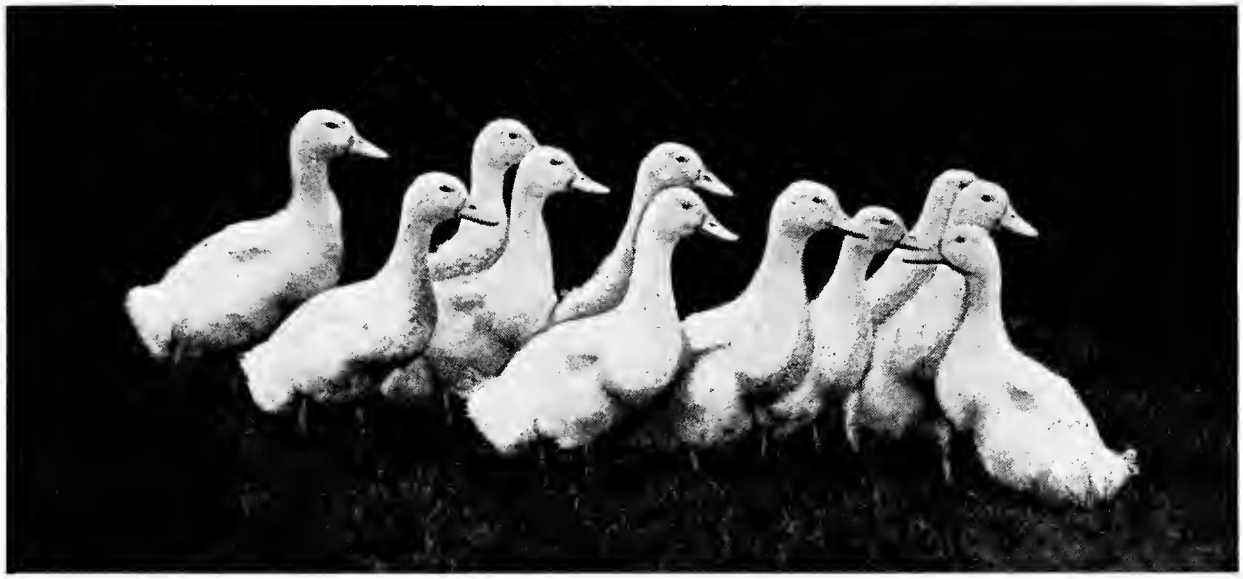


FIG. 259. ELEVEN OF THE BEST

A batch of Aylesbury ducklings after a hearty meal. Birds of this breed make first-rate table ducklings at about ten weeks old

Markets for table ducklings exist in different parts of the country; and the producer of suitable birds should find no difficulty in disposing of them, if he will study the markets. It may pay him much better to cater for local demands than to attempt the London spring market, because only the very best bird is required at Leadenhall and Smithfield; hence to send second-grade ducklings to either of them will not be remunerative for the sender. The demand commences about the end of March and lasts for rather more than three months, after which time prices fall rapidly —from 2s. 9d. to 2s. 6d. per lb. down to 10d. to 1s. per lb. wholesale, the latter being for Aylesbury ducklings from the middle of June onwards. Much

better prices can be secured during August and September in such places as seaside towns and other holiday resorts for ducklings not Aylesbury. That the trade can be greatly extended I feel sure; but the beginner with ducklings should make full inquiries before he attempts anything on a large scale.

Small Units Preferable

Just a few more words before concluding this subject. Ducklings must be properly managed, whether they are being reared for market or as stock for egg production or breeding purposes. They are as jumpy in their moulting stage as are chickens which are being battery-brooded, even more so, as a matter of fact; and also when they are being fattened. It never answers to pick them out of the fattening pen in twos or threes for killing, because to do so will upset the remainder and may well cause them to go completely off their legs, and off their food. When they have to be killed it should be the whole flock in one section, no matter how much difference there may be in their weights; and the birds should be driven gently into a place from which they cannot escape and, also, where they will not injure each other in their fright. For this reason I prefer small to large flocks, despite the extra cost of the fences and the little extra trouble it entails in feeding the birds. I find, too, that they settle down much better to their food, and thus put on better weights, if they are reared almost from the first week on the ground where they will be fattened and finished.

It is also beneficial to take time over their management, to feed them regularly, and to be as quiet as possible when attending to them. On no account should they have free range; and they must be kept dry, especially in their very early days, even their water trough being so arranged that they cannot get a soaking if they should enter it, as they generally attempt to do, following their natural instinct. Moreover, it should not be so steep-sided as to prevent their getting out, because it is a very simple matter for "baby" ducklings to drown. Duck-keeping as a side-line pays well enough, while table duckling raising can be a most remunerative whole-time business.

CHAPTER XVI

GEESE FOR STOCK AND MARKET

YEARS ago in this country, goose was a favourite dish at the Michaelmas and Christmas festivals; and to such an extent was "the king of birds" in demand that, at certain seasons, it was a common occurrence for herds of young geese to be seen spread over pasture-land, where they were tended by someone whose sole occupation was to walk them to the feeding grounds, to keep them there, and to see that no harm came to them while they were grazing, because by so grazing the birds grew plump for market. There will be few, if any, of the present generation who can recall such a sight; but it is one of the things we read about, those of us who are interested in the history of the poultry industry of our land—just as we learn from books that the goose is the oldest of domesticated birds, having been kept by the ancient Egyptians, and that it was found in a state of domestication in Britain when Caesar first visited these shores in 55 B.C.

Now, although in both of these cases the breed appears to have been the Gray-lag (*Anser cinereus*), it has been found nesting in the Fen districts of Lincolnshire, and I understand that it still breeds in Scotland and our northern islands. It is very many years since vast flocks with goose-herds in attendance were seen in England; and yet there was a time, and not too far back either, because I can recollect it, when huge quantities of goslings were reared and fattened in Norfolk and Lincolnshire, and when our imports from Ireland and the Continent, of live young geese for grazing, were very considerable. Nevertheless, while the goose industry still thrives in the Eastern counties, and, too, in parts of Wales, its proportions are nothing like as extensive as they were even in my early days.

However, those who can appreciate the real goodness of gosling flesh will be pleased to note that the goose is gradually gaining ground again, although it is questionable if this waterfowl ever will be as great a favourite as the turkey; which is somewhat surprising, because the rearing of goslings is not as difficult as raising turkeys. The biggest season for goose as a table dish is a short one at present, being confined almost wholly to a few weeks about Christmas time. Admittedly, in some districts there is a demand for goslings from about August on to Michaelmas; although with it all, the rearing of geese for market does not yet afford sufficient scope for it to be a whole-time industry, but rather a part-time occupation.

As such, therefore, it should be considered, because, since the goose is essentially a grazing fowl, and a close grazer, too, to keep this stock on a scale sufficiently large to enable one to earn a living from it would entail a great extent of land at a decidedly low rent. Granted, I recall reading an account of an experiment carried out by a general farmer in Cardiganshire who, in 1930-31, by selling table goslings at 1s. 4d. per lb. for Christmas, proved that over £10

FIG. 260. THAT GEESE ARE AMICABLE BIRDS IS WELL SHOWN IN THE ABOVE PHOTOGRAPH OF A YOUNG GOOSE-HERD AND HER CHARGES

profit per annum was realized from each stock goose; but anyone would be rather unwise to stock largely with geese under the impression that such a profit is within his reach. Goose-keeping, however, can be undertaken as a remunerative side-line, although there are probably few specialist poultry-farmers who would consider it so, for the very simple reason that their land would be fully stocked with birds which yielded quicker returns and more profit per acre.

Their Value as Grazers

There is, nevertheless, an opening for goose rearing in this country; and it should be a sound proposition for farmers, smallholders, and others who have at their disposal a wide range of grazing land. There is an old belief that four geese will consume as much grass as a cow, which is thought to have no foundation in fact; but if geese be enclosed in a small run and not fed with grain and meal, then three fully-grown birds will assuredly eat as much herbage as a sheep, of which I have had ample proof.

Pasture-land on which sheep and cattle fatten easily, nevertheless, is not absolutely essential for them, since they will thrive on low marsh-land, while grassland which holds no feeding for large farm stock will suit them—they are such close grazers that they can live and do well on pasturage which is too short for cattle. Moreover, they will greatly improve the grazing for other animals by eradicating many pestilent weeds. Although I do not advocate the mixing of the different species of poultry, I have found that the growing goslings will range amicably with laying hens; and yet there seems to be a feud between our stock geese and Aylesbury ducks, though the former will tolerate the young turkey hens and a few Indian Game bantams which insist upon ranging.

Suitable Accommodation

Geese must have plenty of land over which to range; and while a breeding pen might be kept on a small enclosed area, I find they so quickly foul the land when penned up that I much prefer to let them wander. In this matter, however, they are not too troublesome, because if a paddock be handy, they will not stray far; and, moreover, they certainly warn one of the approach of strangers. They require nothing elaborate in the way of a house; and it is a mistake to imagine that anything on the lines of the buildings one generally sees when geese are being bred for exhibition purposes is necessary for their comfort. I have seen them in substantial houses, brick-floored, 5 ft. to 7 ft. high and with 12 sq. ft. a head for bedding them down; but if those of the very largest breed were allowed half that amount of floor space, they would have plenty of room to be comfortable.

Geese are remarkably hardy, and it is for this reason, no doubt, that so often they are allowed to sleep in any tumbledown shed which affords them some sort of shelter. It is advisable, however, to provide special quarters for the accommodation of stock birds in winter. I have kept a breeding pen in a small lean-to bantam house, and in a wood shed; but six of them (Chinese) are housed at present in what was intended to be a kennel for a sheep dog. It is span-roofed, with a floor space of 6 ft. by 4 ft., 2 ft. 6 in. high to the eaves and 3 ft. 3 in. to the ridge. It has ridge ventilation; and the floor is well littered with straw. One side was taken out, and it is fitted with a wire-netting door to secure the birds at night; and as they have passed two winters with such sleeping quarters, it suits them. It is essential to keep the house free from floor draughts, and fox-proof, while for goslings up to about six months old, it must also be rat-proof. The least amount of floor space to allow stock geese is 3 sq. ft. a head, but an extra foot is decidedly better.

No one would attempt to keep geese, even of the best laying kinds, as competitors with hens for the production of market eggs. Admittedly, some folk can digest such eggs when boiled, while those laid by the young birds which have not reached breeding age are greatly appreciated for culinary purposes—I have it on most excellent authority that in the making of such comestibles as cakes, etc., they have no equal. But they cannot be produced at a cheap enough rate to be sold for eating; hence if those from the stock

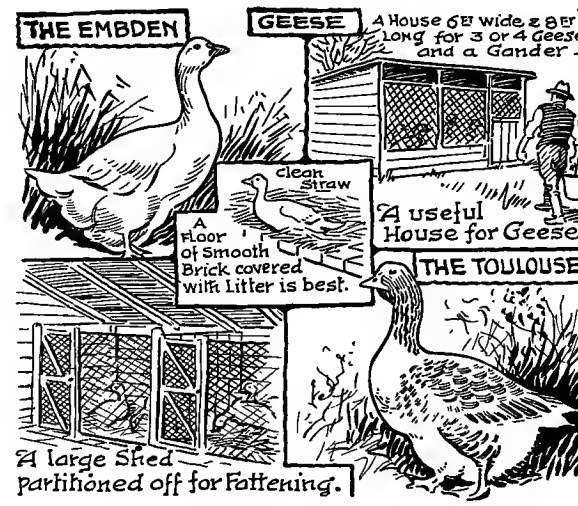


FIG. 261. ACCOMMODATION FOR GEESE

Houses for stock geese should be such as will ensure plenty of sunlight and fresh air. A floor of brick covered with straw makes an excellent bed for them at night. Part of a cart-shed, partitioned off, will provide suitable accommodation for birds which are being fattened. Both the Embden and the Toulouse are good breeds for market, while mating an Embden gander with Toulouse geese produces fine table goslings

pens are not required on the farm for the gosling trade, they can generally be disposed of for hatching. The birds, therefore, do not require an expensive house; but I find that good accommodation and proper feeding do much to encourage reasonably early production of eggs, although geese cannot be termed prolific layers all through winter.

Selecting Stock Birds

Many things have changed in the poultry industry during the past few years; and just as the modern egg-producing farmer has revolutionized his methods of keeping hens, so the goose rearer must get rid of old notions and run his stock on up-to-date lines, and his first move should be to get suitable birds. Although comparatively few breeds are to be met with in this country, there are plenty from which to make a selection. The Embden (White) and the Toulouse (Grey) were the favourite pure races of my young days; and both were heavy birds, the standard weights of the former being 25 lb. to 30 lb. for ganders and 23 lb. to

28 lb. for geese, while Toulouse were a pound or more heavier. When the demand for market geese was for big birds, there were no better breeds, the Embden being particularly suitable for the Michaelmas market, with goslings often fit to kill at five months, while the Toulouse, not making such quick growth, was fattened to remarkable weights for the Christmas demand.

FIG. 262. AN EXHIBITION EMBDEN GANDER

A typical specimen of the standard-bred Embden. A well-known prize-winning gander

However, these are the days of small joints; and the goose, like every other species of poultry reared for table, has had to come into line. The English Grey, or saddle-back, goose might have answered; but it is practically the barndoor of waterfowl, so badly has it been neglected, while the exhibition strains of Embden and Toulouse, still maintaining their great size, are scarcely suitable material for the purpose. Small breeds have to be chosen to meet present-day demands; and there are at least three which can be selected. They are the Chinese, the Roman, and the Brecon Buff, this last-named being a very recently introduced kind.

The first, the Chinese, is also known as the swan goose, the knob goose, and the Spanish goose; and this fact is worth noting, lest the various names be taken to indicate different breeds. There are two varieties of it, the Brown (or grey) and the White, the latter having been rarely seen in this country until some fine specimens of it were imported from Canada about two years ago for experimental purposes. The Brown has often been confounded with, and called, the African; but this breed resulted from crossing the Chinese with the Toulouse, and it is, moreover, too heavy to provide the smaller carcass which is suitable for to-day's trade. The outstanding features of the Chinese are the knob or tubercle at the base of its bill, its long neck and upright carriage, and its somewhat small but very compact body; and it has well been termed the Indian Runner of the goose race. Some utility strains of this breed are very prolific layers of white eggs; and there is an authentic account of a goose which laid 141 eggs in fifty-two weeks in her fourth year.

There are also two varieties of the Roman, viz. the Black-and-White, and the White. The greater part of the plumage of the former variety is white, the "black" consisting of dark grey on its head, the back of its neck, its wings, and sometimes the back also;

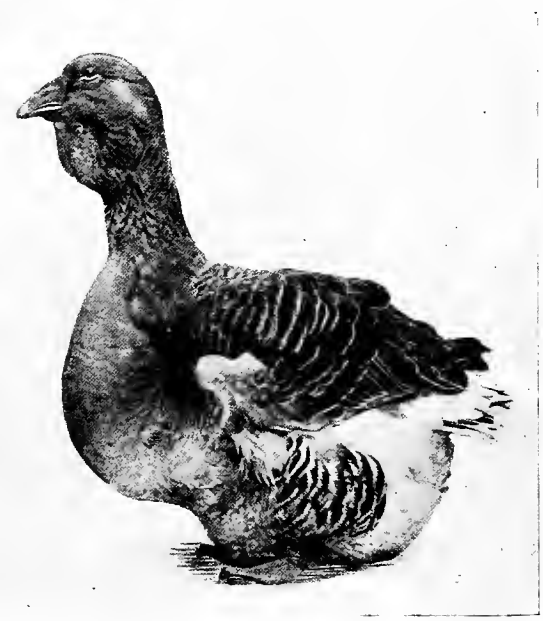


FIG. 263. A TOULOUSE GANDER

An ideal exhibition Toulouse gander which has many prizes to his credit

but few specimens of it have been met with in England, and the White is the only one with which I am familiar. This breed is of somewhat upright carriage, but of stockier shape than the Chinese, owing to its thick neck; and to all intents and purposes its body formation may be described as very similar to that of the Embden. It, too, is a good layer and, like the

utility Chinese, a good forager, of rapid growth, and decidedly useful for the production of summer and Michaelmas goslings, while the standard weights of both are similar, viz. ganders 10 lb. to 14 lb., and geese 8 lb. to 12 lb.

The Brecon Buff—its full Standard name as accepted by the Poultry Club in October, 1934—was originated by a breeder in Glamorganshire, and bred by carefully blending the Embden with buff-coloured geese, which are not altogether rare at hill farms in Wales. Welshmen have always been keen on the breeding of geese; and the Brecon shows promise of being a popular breed for present-day market demands. It is of the Embden type—but nothing like as heavy—active, and naturally hardy. Having been specially bred for table purposes, its skin is of good colour when the bird is plucked. The plumage is not one tone of buff, similar to the Buff Orpington duck, for instance; but it is best described as buff where the Toulouse is grey, being, in fact, marked like that ancient breed. The specimens I saw at the Poultry Club Council meeting when the Brecon was standardized appealed to me as good utility stock.

The Breeding Pens

One great advantage of the light breeds is that a vigorous gander can have four mates instead of the customary two, while they can be depended upon to produce a supply of eggs for hatching from February on to nearly midsummer, instead of the usual one or two batches from each goose. Therefore, it should be possible to cater for the late summer, the Michaelmas, and the Christmas trades with goslings instead of fat geese; and it is the small bird which is required to-day. When selecting the stock birds it is advisable to choose those which are at least two years old, since, even when early eggs are required, geese of such an age can generally be relied on to commence laying in February. It may be stated that geese are in their prime for breeding from the third to the ninth year of life, while females up to four and five years old have been known to commence laying just before March. Admittedly, yearling geese can be bred from, and birds of such an age are frequently used for the production of market goslings, that is, when the whole of the progeny is required solely for killing; but it is not a plan to be recommended for goslings which have to be developed for stock.

Some goose rearers prefer cross-bred to pure-bred goslings for market; and a favourite cross is the Embden gander with Chinese geese, both breeds being of utility and not exhibition or ornamental strains. Such a cross can certainly be recommended, because the goslings will be fast growers, meaty, and of excellent flavour. Like ducks, the birds should be mated months ahead of hatching time, and also settled to the house they will occupy all through their breeding season. Two or more mated pens may be safely allowed to use the range at the same time; but in this case it is advisable that the ganders be brought up together from their early days, to prevent fighting. It is, too, essential to provide each mating with its own sleeping and nesting quarters, so that when the ganders are fully mated they will keep to their own geese and return to their own house at night.

Feeding Stock Birds

It is scarcely necessary to add that the stock birds must be perfectly healthy, well fleshed but not fat, active, bright-eyed, hard-feathered, and fairly well up to the minimum standard weights. These points are particularly necessary in the gander. Because geese do consume large quantities of grass and vegetation, it must not be thought that the breeding stock do not need any, or but little, grain and meal to ensure the females producing eggs early in the year; but, provided the range can be depended on to yield a liberal supply of grass—and without it they cannot be kept successfully or economically—the cost of feeding them will not be a serious item. One good meal daily may be all they require, except during hard winter weather or an excessively dry spring when their natural food is scarce.

Being of active habits they may safely be fed with maize and maize meal; but they should not have a great quantity of corn, their rations being mostly of mash. Nevertheless, as it frequently happens that the commencement of laying is hindered by the policy of leaving the birds to look after themselves, they should be fed from October until June, but not fattened. Whole maize can be used as the grain; or a mixture of maize and wheat in equal measures will do quite as well, and a small handful of it for breakfast (less than 2 oz. a head) will be ample for each bird to encourage them to graze. It can be scattered on the grass, because they will find it readily enough; but they prefer it from a shallow dish of water. When they return in the evening let them have a trough of mash, if necessary, their soft food always being given to them in a crumbly moist state. This food can be made up of five measures of maize meal, four of middlings, and one measure of meat-and-bone meal.

Since they are vegetarians, well chaffed and scalded clover hay may be advantageously mixed in the mash up to two measures, replacing that quantity of middlings. If, however, it is omitted, then the meal mixture need not exceed 2 oz. (weighed dry) for each bird, although in hard weather it should be increased to 3 oz. or slightly more. Raw and sliced swedes and turnips, whole potatoes, beets, etc., also suit them

throughout the winter months and assist in keeping the corn bill low. Cabbage greens are not usually satisfactory, although when not too tough, they can be boiled, finely chopped, and given with an equal amount of boiled potatoes as a change; but in this case as an extra weight to the mash, beyond the 2 oz. already mentioned. During winter, also, they may have a bundle of hay fixed for them to pick at, so placed that they cannot pull it down to trample on; it keeps them amused when the weather is unsuitable for them to range far, as during snow or hard frost.

The object of the feeding should be to get the stock geese into a laying condition as soon as possible in February; and this can be done only by paying proper attention to the matter. When it is found that the first batch of eggs which has been set is infertile, it generally means that the birds have been wrongly fed. On the other hand, such an occurrence can be due to the owner failing to mate the pen in sufficient time to allow them to settle down. Hence, if a gander has to be bought in, he should be obtained in autumn. The feeding of stock geese from late June to October can be limited to grain only; and 2 oz. a head, in the evening, should be ample, less than that amount if grass is plentiful, and none at all if stubble fields are available. One item that must not be omitted from the feeding of geese is water. No matter if pond or stream be within their range, keep a good bucket of water near their house; and put it inside the house when they have to be shut in early. But fix the bucket; otherwise they will probably upset it in attempting to get a bath.

Goose Eggs

When the birds come into lay, the eggs should be collected from the nests daily; and they should be set before they are a week old, if the best results are desired. To take them away does not mean, as some people imagine, that the birds will therefore be induced to lay a double batch without a rest; but it may well prevent them falling broody. Geese of reliable utility strains of the Chinese breed generally produce their eggs in batches of twelve to fifteen, and then probably want to sit; but when the least sign of broodiness becomes apparent—by the goose sitting closely on her nest, instead of laying—the bird should be immediately confined to a house with a bare floor, one devoid of litter, since such treatment will generally encourage her to return to normal and commence her second batch of eggs.

I have provided geese with 2 ft. 6 in. square boxes in which they could lay, but they make their own nests on the floor litter of their sleeping houses. So far, I have not had a goose which laid away in a secluded spot, although hedges and other quiet places are within their range; but it is as well to keep an eye on them, because they may take a fancy to an outhouse. Still they appear to be somewhat conservative creatures, and prefer to lay where they sleep; hence they should be allowed to have the same house during the whole time they are mated. Some rearers do not find it convenient to keep stock birds, but purchase eggs or day-old goslings each season. Prices vary, of course; but the eggs cost about half a crown each, or more if special strains are required. Those from the usual farmyard birds—if such stock are in lay early—might probably be bought for less; but unless the owner of the birds specialized in market goslings, it would be risky. Early eggs and day-old goslings, however, are seldom on sale, and one has generally to wait until spring has well advanced before being able to obtain them.

Hatching and Rearing Goslings

Goose eggs can be hatched artificially—the period of incubation is twenty-eight to thirty-four days—in which case the machine should be operated as for duck eggs; but goslings cannot be artificially brooded. For this reason, and, too, because better results are generally obtained when the eggs are hatched naturally, large broody hens should be employed, for the earliest hatches at any rate. Geese will incubate their own eggs, ten to a dozen of them, while the eggs can also be set under turkey hens; but good general-purpose hens are preferable—and they must be good, not only close sitters but strong and in sound condition. Four eggs may safely be put under each hen, although large birds will take six.

An important point is to make the nest deep, basin-shaped rather than shallow like a saucer, and so that the hen can sit in it and prevent the eggs rolling out. The usual sitting boxes will do for the purpose, but the nest must be on the earth and not with a wooden bottom. The eggs must be gently turned by hand, daily; and in dry weather, or when the hens are sitting in a shed, the vicinity of the nests should be kept slightly damp, while during the last ten days the eggs themselves should be sprinkled with warm water a few minutes before the sitters are returned. Compared with chickens, goslings take a very long time after starring their shells before getting out; and I have known some eggs to be down for thirty-four days before the youngsters made their appearance. During hatching, therefore, the hens should not be disturbed, except to remove any empty shells; but a sitting goose can be left entirely alone.

Our hens are set in earth-floored houses, and always on the ground, with ½ inch-mesh wire-netting bottoms. The nests for the goose eggs are made of earth, with hay on top and plenty of it, to fill the corners and

ensure the basin shape; and the sitters are lifted off and on, not allowed to enter and leave as they like. Hens which are accustomed to their attendant, and which are properly treated and given nothing but maize, can be trusted to sit out the time; but if plenty of broodies are procurable, it is not a bad plan to have a couple in reserve, starting them a week later on hen eggs, so that if they are not required to take the place of any which may refuse to continue with the goose eggs, there will be an odd brood of chickens for someone to rear. These odd small broods, let me remark,

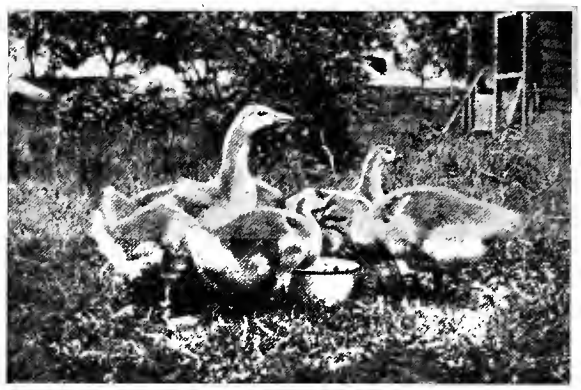


FIG. 264. CHINESE GOSLINGS

A small brood of Chinese goslings at the two-month-old stage. These birds were the progeny of a goose which laid 100 eggs in her first season

are not always favoured by the chicken man who has his hands full in the rearing season.

When the goslings are hatched, and the hen has had a good meal—she must be fed and watered daily as is usual when dealing with sitters—they should be left for a day to think things over; and if they are allowed to remain undisturbed for thirty-six hours they will be all the better for it, the nest being free of shells. One old hen we set—a marked down perfect mother—appeared to get the surprise of her life when she first caught sight of her charges, which were Chinese. It was her initiation as a hatcher of goose eggs; and the bright little black heads which greeted her when she was allowed to walk back to her nest almost made her forsake it. However, good hens which are well managed will mother goslings as readily as the young of their own species.

During Early Days

At the end of their first day or so they should be transferred from the nest box to a large coop; and one, of the double-compartment pattern, I mention for use with chickens will suit them. To it should be attached a wired-off run, the width of the coop and about 6 ft. long, which will require moving daily to a fresh patch of grass; and during the first three weeks each hen with her brood must be kept apart from others. Let them have access to fresh short grass from the start. Goslings are sturdy little birds from the shell, and soon feel their feet; and they can do without the hen after the fourth week of brooding, although I generally have one hen to every eight birds until they are about eight to ten weeks old, unless she leaves them of her own accord before then.

If a goose be allowed to sit—and she will choose her own nest—she should not be shut into a nest box, although she must be protected from marauders. Other geese, and even the gander, will not disturb her; but it is advisable to prevent their doing so, because she should be left alone as much as possible, as she will need no other attention than a daily visit of the owner with fresh water and food, which should be placed within her reach. She can easily cover ten to twelve eggs, and will see to the turning of them and keeping them damp. However, she should not be allowed too much freedom when her young are hatched, because she may walk them off their legs. It is as well, also, not to let the ordinary broody hen have a great deal of liberty, since she may be too vigorous at "digging" and may, quite unintentionally, injure one of the goslings. Still, they are hardy, and, in fact, the easiest of all poultry to rear, although it pays to give them attention, especially during rain.

For the first twenty-four to thirty-six hours they will not eat anything but pull at pieces of grass, while until they are about four days old their appetites are very small. No attempt, however, should be made to force them to eat, because they will do so quickly enough when they are ready. We generally give them a sod of grass, just outside the coop, to play with for the first three or four days, that is, if the weather is too wet for them to be allowed into the grass run. And it is essential to keep goslings dry, in their coop as well as outside, for the first two weeks; hence, the use of the enclosed run, over which we put sacks on wet days. Strange though it may appear, nothing kills goslings off so quickly as a drenching of heavy rain, while they cannot stand much sun—which also applies to ducklings during their earliest days. Litter them down with straw, and keep it frequently changed to ensure dryness. Give the coop a solid wooden bottom, which will prevent damp getting through it; but be very careful to see that there is always plenty of litter on it, because they cannot steady themselves on a plain board floor, which may very easily result in leg trouble. These may appear to be unnecessary precautions; but they repay one, just as it is beneficial to see that rats are not allowed to get at the birds.

Suggested Diets

Goslings may be able to exist on grass alone; but while the herbage may be of the best, they will probably require hand feeding for the first two months or so. It must not be supposed, however, that they need such delicacies as bread-and-milk, or such indigestible mixtures as hard-boiled egg and bread crumbs, with chopped cabbage. They are sturdy birds and benefit by a plain diet; and for them there is none better than a mixture of five measures of maize meal, four of middlings, and one measure of sound meat meal or very fine meat-and-bone meal. There are, of course, other mash mixtures.

Some rearers start their birds on biscuit meal, bran, and middlings for the first month, and then change to maize meal instead of biscuit meal, and add 5 per cent of fish meal. Others give their goslings barley meal, boiled wheat, and potatoes in equal parts by measure, the wheat being scalded and then simmered until thoroughly swollen, when it is worked up with the potatoes and finally the barley meal. I prefer the first one mentioned as it can be used all through their life, the meat meal being about a quarter of a measure to begin with and then gradually increased to full strength; it is a reasonably cheap mash and gives the birds a good start, while it can be very quickly prepared with boiling water and made into a crumbly mash. For the first fortnight the drinking water should be put into very shallow vessels in which the goslings can get their bills only, as it is essential to prevent their getting chilled by paddling in the water.

After ten weeks, they may have a small handful a head of whole corn for their breakfast, and mash as above (about 2 oz. dry weight for each bird) in the evening. To accustom them to this change of food it will be found beneficial to start them with par-boiled broken maize or soaked whole wheat, putting a little of it into the mash trough and sprinkling it very lightly with maize meal or middlings, but so that the corn can be seen. They will soon acquire the taste for it, when the dry grain, whole maize or wheat, can be gradually introduced. The corn can then be put down on the grass in small heaps, or into a shallow drinking vessel; it is advisable to watch how the birds clear the food, and to adjust matters accordingly, although I find that they prefer it when placed into water, as do most waterfowl.

Even though grass be plentiful and the goslings are grazing strongly, they do not make the best growth on herbage only. Up to the age of about three months they should get two meals *per diem*; but after the sixth week the quantity for the birds which are being reared for stock should be limited to 3 oz. to 4 oz. a head, until they are furnished, when they must be fed as adults. Throughout the very best growing season, i.e. a warm and moist summer, they should have one meal, and preferably towards evening, to encourage them to graze during the day and to return to their quarters. Until they are ranging freely they must be protected from rats and other vermin; hence their coop or house—and it will be the latter—should be vermin-proof and closed at night. I have said that eight goslings may safely be given to a hen; but when the birds are allowed their freedom and the hens have been returned to their own runs, as many as a score of the young birds can be housed together, while more than this number may safely be allowed to use the same range, but not with the old stock, if the latter are at all quarrelsome. It is not advisable, however, to exceed a score in one house.

"Green" Geese

The object being to raise goslings for market, the markets will have to be studied. The great advantage of keeping the light breeds or a cross such as I have suggested, is that they can be depended upon to produce eggs for hatching from February on to nearly midsummer, while some birds lay also in autumn, and, too, into winter; and under favourable conditions up

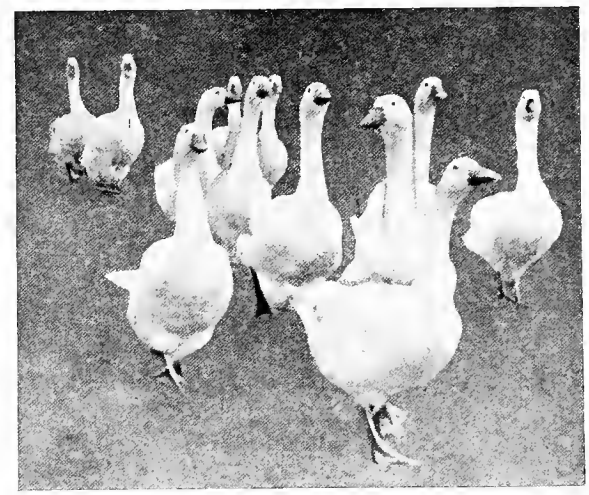


FIG. 265. UTILITY EMBDENS

A dozen young Embden geese of the active utility type. One can imagine such birds being good foragers

to 140 eggs can be obtained from each goose of a thoroughly utility strain, instead of the usual one or two batches a head. This means that the earliest hatched goslings should be ready for the "green" market in August, and those hatched a month or two later fit for the Michaelmas demand, while the latest eggs laid will be quite soon enough to provide birds for Christmas.

It is quite possible, with good management and proper feeding, to produce a 10-lb. bird at ten weeks; the most popular weights range from 8 lb. to 12 lb. alive. For the summer trade, however, 10 lb. is much too heavy; hence, these birds being "green" geese —which means grass-fed goslings—they should not get more than one meal a day after they are three months old. Some rearers, however, stop hand-feeding the birds altogether at such an age, when plenty of succulent herbage is available; and they will certainly then be grass-fed and sold off the grass. The summer demand for these birds is the one which the producer will probably be doubtful about; and yet there is, and always has been, a certain sale for green goslings. Nevertheless, it is one which will require working up; but there should be ample scope for markets at seaside and other holiday resorts, and with a little enterprise much can be done in this direction.

FIG. 266. CROSS-BRED GEESE
A fine flock of first-cross Embden-Toulouse geese on a Surrey farm

Birds for Michaelmas and Christmas

As a rule, there is more likelihood of sales around Michaelmas, although there is room for extension of this market; and if the rearer be a farmer, the goslings should be able to get into excellent condition by ranging the stubble fields after harvest, since not only will they find as much corn as they require, but plenty of herbage. Ranging goslings, which have had to find their own food almost from the time they left the hens, have been known to increase their weight by 3 lb. and more after being on such feeding grounds for three or four weeks; and when the grain has been thus gleaned from the stubble fields, they require only one short meal of mash to keep them up to killing condition.

Where, however, stubble land is not available, the birds can be folded on turnips, rape, lucerne, and other crops; they will clear the turnips of the green tops, and the roots can be chopped up for them. Such folding—similarly to sheep, but not in the fold pens which are used for fowls—is beneficial. But, even failing these facilities, it is still possible to rear good Michaelmas geese by giving them a full meal of corn in the evening. Early hatched goslings, at any rate those which are out in spring, should certainly be disposed of, at latest by Michaelmas, because it will not be economical to keep for the Christmas trade birds which should have been ready in September.

For this final market of the year, young geese will meet with a much readier sale than those which have been pen-fed and fattened to excessive weights, and 12 lb. should be the limit. The public to-day want a moderate sized bird, and with as little fat as possible, since goose grease is no longer used for oiling one's boots or one's chest in winter, as in bygone days. The goose as a table bird must come into line with the demand for small joints; and so, since a medium sized and a more meaty bird is required, the public should have it, particularly as it can be produced at less cost and with a much better chance of profit to

the producer. Goslings from the late spring and summer eggs—the last hatched of the season—can be fed to scale 8 lb. to 12 lb. for the December markets; and 10 lb. will be a nice weight.

Such birds should not be hand-fed after they are six weeks old, but ranged unless the weather is abnormally dry, and started again towards the end of September—or not until the first week of October if the grazing is good—with 2 oz. a head of maize *per diem*, and in November changing over to mash of a similar weight, and gradually bringing it up to 6 oz. birds will not make the weight—and commencing their fattening period in October. By about the middle of that month they should be put into a shed, and their "range" confined to a small grass run or yard adjoining, where they cannot see other geese at liberty. The shed must be dry and airy, and well littered with straw. Two full meals *per diem* will be required; and for the last four weeks the birds will have to be confined to the shed most of the day, allowing them out for about half an hour in the morning and again in the evening.

FIG. 267. EMBDEN GEESE
A group of pure-bred Embden geese on open range

each, as two meals. This mash can consist of four parts of maize meal and one part of middlings, or equal parts of barley meal and boiled potatoes, the parts being by bulk (strike measure) and not weight. There is no need to shut them up during their fattening; let them range, but feed them heavily for breakfast, two-thirds of their daily allowance as the first meal, and they will not wander far from their house. Light breeds of geese, such as are now required for table, do not put on fat like the old-fashioned Embden and Toulouse or the cross of these two breeds; but they are not now shut up and fed for the heaviest weights.

Special Fattening

Of course, if there should be a local demand for the fat Christmas geese of old days—as there is in some parts of the country even to-day—cater for it, if contracts can be made at prices which will pay for their production. It will mean getting Embden-Toulouse (first cross) or sturdy farmyard day-old goslings from the usual spring hatchings—summer

They can have one meal of corn—wheat and maize in water—and one of mash until they are shut up, when mash only should be allowed; and it can be made of two parts of barley meal, one part of maize meal, and three parts each of middlings and boiled potatoes, while during the last ten days before they are fasted off for killing, half a measure of finely chopped rough fat should be mixed through the mash. Plenty of drinking water will be required daily. They will be weighty and fat when ready; but those of us who know the delicious flavour of the succulent flesh of gosling are inclined to prefer to have our goose served in its early youth, and especially grass-fed. However, it is wise to cater for different tastes.

When goslings or young geese are being fattened, whether they range, or are yarded for Christmas, it is advisable to house them in such colonies or numbers as are required to be killed together, because if only part of their numbers are dispatched, those which remain are very apt to refuse to eat and, consequently, go right out of condition; and when this happens it is very difficult to get them fit again. I

have known this to occur when three or four broods have been ranging together but each having its own sleeping quarters; and it may be because of this that, where large numbers of goslings are run on for market, they are accommodated in rough sheds.

However, when they are being confined for fattening at Christmas, and only a few are being dealt with, the whole of them should be killed the same day. It will be found, also, that a dozen together will put on better weights than if only two or three are penned for fattening. Goslings can be killed by dislocation of the neck, similarly to fowls; but since one requires much practice to do it expeditiously, I think the novice will find it better to sell the birds alive and let someone who is thoroughly accustomed to it do such work. It will also save him the somewhat tedious task of plucking, although it is easy enough to those who are used to it.

Distinguishing the Sex of Goslings

One matter I have not mentioned in connexion with goslings is that of distinguishing the sex in the early stages. This scarcely becomes necessary except if the birds are being reared for stock, because when the object is table production both males and females are raised for early killing. However, while the novice will find it a difficult matter if he has to depend upon outward signs, I have never known anyone experienced in handling waterfowl make a mistake with goslings—and ducklings. It is simply a matter of examining the *cloaca*, or vent, of the bird; by stretching it transversely and gently pressing it outwards, the copulatory organ of the gander can be distinctly seen, while in the *cloaca* of the goose no such organ is visible.

This method of sexing waterfowl was known to specialists long before the much more difficult sexing of day-old chicks came into vogue; and it was demonstrated to me many years ago by the late William Cook, the originator of the Orpington fowl, and who was undoubtedly one of the most practical all-round poultry authorities of his day. The early sexing of goslings enables the rearer of stock birds to fatten off the ganders if necessary; but in any case it is advisable to keep stock geese unmated until they are two years old.

CHAPTER XVII

SUCCESSFUL TURKEY RAISING

WHILE the goose has always been considered among the very hardiest of our domestic races of poultry, as indeed it is, the general opinion appears to be that the turkey is the most weakly bird with which the poultry raiser has to deal; and it is by no means rare for writers, at any rate those who are not specialists, to refer to it as "that delicate bird, the turkey." Nevertheless, this is actually a myth, because turkeys are naturally extremely hardy birds from their youth up, and equal to Pit Game for standing the weather throughout a severe winter. They can be bred, reared, and managed as easily as other feathered farm stock, if they are understood.

No doubt the average poultry-keeper lacks the facilities for turkey raising on anything like a large scale for market, although a correspondent once assured me that, as an experiment, he had successfully brought up, as Christmas fare, four poults in an ordinary suburban garden, but at a cost which ruled them out as a paying proposition. Still, even when suitable accommodation is available, not everyone has the patience to attend to the birds in their earliest stages of growth. Given proper accommodation and attention, however, they are profitable enough when sufficiently developed to be dispatched for table.

They are, moreover, most intelligent birds to handle, and decidedly interesting stock from the time they leave the shell until fully matured. For the first few weeks of their lives they certainly need close attention, as do most poultry; and yet turkey chickens will not prove any more difficult to rear than the young of other fowls. Comparatively few people appear to realize that the turkey is essentially a nomad and that it retains more of its wild instincts than any other domestic fowl. It never thrives better than when it can choose its own hunting ground; and if that which it requires is not obtainable within the range allotted to it, then assuredly will it wander afield, given the least opportunity for doing so. This I know is the case with unmated young hens which are coming into lay; and on one occasion two of my birds had to be brought home almost five miles because an attempt had been made to settle them to a small pen prior to allowing them to mix with the other birds.

As a matter of fact, turkeys are champion walkers almost from the time they can fend for themselves, and they should have the freedom of a wide range. They do not prosper in complete confinement; and although they may appear to thrive for a time in restricted areas, the almost inevitable result is lack of stamina in the stock birds and mortality among the chickens. They suffer by confinement to a much greater extent than do "hens"; but given their freedom they are very easily managed.

Suitable Locations

Turkeys are not suitable for any kind of land; their range should be fairly elevated and well drained,

FIG. 268. ROOSTING QUARTERS

This section of a disused stable made excellent roosting quarters for turkeys in winter. Three stout perches were fitted on a level with the manger, and accommodation was thus provided for a score of birds. The drop-in window allowed ample fresh air to enter when the hatch was closed

dry and warm—the drier the sub-soil the better—and with some natural shelter from wind and rain. Marshland and a cold clay soil should be avoided On the other hand, while a grassy hillside with a southern aspect might answer for matured stock, it would not be a desirable place on which to keep young birds during an extremely long spell of dry weather in summer. An orchard will suit them; and almost any woodland, particularly with oak or beech, will provide an excellent range if there is also available fairly good pasture.

Turkeys are most omnivorous feeders, devouring not only grass and other herbage but quantities of wild seeds and fruits, insect life, roots and other natural forage, as well as the usual corn and mash prepared for hens; so it can be understood that to keep them successfully and with strict economy in their feeding they require a wide range. For this reason, obviously, turkey keeping should make its

greatest appeal to farmers and others who have extensive lands; and the farmer should be able to make turkey raising more of a success than most people, not only because he can allow the birds to have the extent and variety of range which they like best, but he can effect economies in housing and feeding which do not come within the scope of the average poultry-farmer.

Housing the Birds

Housing plays an important part in the management of stock turkeys. Admittedly, the birds will maintain vigorous health if they are permitted to

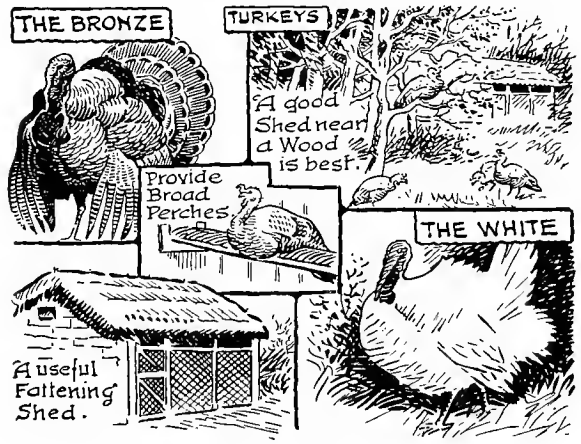


FIG. 269. ACCOMMODATION FOR TURKEYS

Where possible stock turkeys should be housed near a wood, since they thrive well in such quarters. An apex-roofed shed, thatched, and with wire-netting front, makes an excellent place for those which are being fattened. Turkeys should always be provided with broad perches. The Bronze and the White are good breeds for table, and if hatched in June they will make suitable weights, by Christmas, for consumers who prefer medium to heavy birds

roost in the trees in all weathers: but under such conditions they are much more difficult to handle than when they are properly housed. And that is where the farmer has a decided advantage, because in most instances he already has sheds, barns, and other buildings at his disposal, while, failing them he can, generally at the minimum of expense, put up thatched hurdles and similar rough shelters which make suitable accommodation. When large flocks are kept and buildings have to be erected specially for them, it is an expensive item. No doubt, ideal roosting quarters are trees selected by the birds themselves in a park; but few breeders care to risk their stock sleeping out at night, owing to two-footed thieves. Adult turkeys can be trusted to roost out of the way of foxes, unless exceptionally cold weather during the winter months makes the animals too venturesome from hunger; but it is very difficult to prevent a haul being made by unscrupulous persons during the night when the birds are roosting some distance from the homestead, and that homestead is off the beaten track. To prevent any such loss, therefore, it is advisable to accustom the stock to sleep where they can be made secure at night.

A large, roomy but not draughty, open-fronted shed makes a splendid roosting place. Turkeys must have plenty of fresh air; and the usual cabin type of fowl house would be useless for them, unless the front were entirely removed and fitted with particularly strong wire-netting. Nothing of an elaborate nature is required; but while some breeders simply provide their birds with broad perches placed in a convenient part of the range under trees or with thatched hurdles as the roof, our birds sleep in a 10-ft. high building with an earth floor, and the door is of wire-netting, with three-ply wood—an odd piece which was handy—for 3 ft. at the bottom. The floor is solid and level, but there is always plenty of rough litter under the perches. These latter are poles of 4 in. to 6 in. diameter, almost round, and with the bark left on, similar to the corner posts we use in the fowl pens; and they are fixed about 2 ft. 6 in. high—under rather than over—with plenty of room fore and aft, to permit of the turkeys reaching and leaving them with ease. The perches are 5 ft. apart, and on a level, not in ladder form; and they allow 2 ft. of perching space for each bird.

Thatched houses will suit adult stock; but during bitterly cold and wet weather, and when high winds are blowing, such accommodation does not result in the early production of eggs. Not that turkeys are autumn and winter layers like the up-to-date laying strain pullets; but the sooner one can get the birds into lay and the eggs set the better, because early hatching is essential to ensure a few nice young birds for some folk who do not wait until Christmas to eat home-grown turkey, while it also gives the breeder a chance of producing, for the festive season, the birds of 20 lb. and over, for which there is still a demand.

At any rate, good housing throughout winter—but no boxing in, plenty of fresh air, for nothing is more detrimental to turkeys than impure and overheated air—means eggs earlier than the customary laying season, and without sacrificing the birds' health or being prejudicial in any way. Just a plain sturdy shed with a lean-to roof, allowing the birds plenty of room and fresh air, is all they require for winter. The earth floor is hard and perfectly dry, but it is not littered except under the perches as stated; and that litter is renewed often enough to keep the place "sweet smelling." It does not require any fitments, although we have a peg on which to suspend the food trough

when out of use, and a frame to keep a bucket of water firmly on the floor. If the roof is of the span or hip type, and has cross beams, they should be so fitted with laths or wire-netting that the turkeys cannot roost high, because if the beams are exposed, then assuredly will an attempt be made to use them, and dropping down from them may cause injury. It is useless attempting to make nests in the house, because not one turkey in a hundred would lay in the usual nest box. The hen prefers to make her own nest, in a hedge bottom, a copse, some place where shrubs abound, or, at any rate, where she can conceal herself and her eggs. So, better indulge her to that extent.

Different Breeds of Turkey

There are several breeds of turkey from which a selection can be made; and although, of quite recent times, considerable interest has been taken in the exhibition of this class of poultry, and there now exist half a dozen or more specialist clubs, each dealing with one breed, the domestic turkey is bred in most countries solely for the table. It may here be noted that the wild turkey is still to be found in the Highlands of Scotland—where it is indeed a true game bird—and also under quite natural conditions at Whipsnade. There are not many breeds kept around the farmsteads of Britain, however, and the most frequently met with is the Bronze, but the Black is again coming into favour. The list contains the following: Austrian, Holland, or White; Black, French and Norfolk, a dull black without any white or brown tips and with very little sheen; Blue, Lavender, or Slate, ash-blue or slate, somewhat resembling the Andalusian fowl but, instead of lacing, the feathers are occasionally dotted with black; Bourbon Red or Spanish Golden, a rich red chestnut or mahogany, but with white flight feathers of the wings and some white in the tail; Bronze, American and Cambridge, plumage of a dark bronze colour, with variegated copper-coloured hues and a rich metallic lustre like burnished gold; Buff or Fawn, pure buff, light fawn, or even a deep red and almost chocolate; Italian, grey-black; and Narragansett, metallic black, with broad light steel-grey bands.

This is a somewhat formidable list; but since the small joints craze has commenced, there are those who assert that the greatest market demand to-day is for small or medium turkeys. Admittedly, at the time of writing, there may be difficulty in marketing turkeys of 20 lb. and upwards, in which circumstances it is giving encouragement to those who breed other than the American Mammoth Bronze and the White, since both of these breeds are scaled, according to standard, as high as 36 lb. for matured cocks, 25 lb. for cockerels, 20 lb. for hens, and 18 lb. for pullets. It is from such breeds as these that the magnificent cockerels of 20 lb. and upwards are produced; and of the former, the American Mammoth Bronze, I once carved a 32-lb. young cock, which was pronounced by those who partook of it as "perfect." Probably the record market specimen for England was a cock exhibited at Ipswich a few years ago, a bird which turned the scale at 40 lb., when rough dressed, i.e.

FIG. 270. AN EXHIBITION SPECIMEN
A young Mammoth Bronze turkey hen ready for the show pen

plucked for market. But although such mammoth birds as those would have to be dismembered, and probably quartered or boned in addition, to suit the oven space of the modern small house, the one which I carved was roasted at home, as are, indeed, those of 20 lb. and over which still give pleasure in my house. However, it is because of this supposed trend of public taste for small joints that small breeds of turkey are being popularized, while it is also the reason for the formation, during very recent times, of so many specialist clubs for the turkey.

Selecting the Stock Birds

In selecting the stock birds, therefore, it would appear that the breed will have to be decided; but no matter which is chosen, the object in view must be to obtain well-developed and thick-breasted birds, if success is to be achieved. It has been put to me that it would be a great mistake to attempt to cater for the small bird trade by making a choice of the Bronze or the White; since, even if the chickens of these breeds were hatched late in the season with the

idea of their not attaining excessive weights, it could result only in half-grown and badly finished specimens which could not realize high enough prices to compensate for their rearing. Such, indeed, might be the case; but, while not having bred the White, I have not found it at all impossible when handling Bronze turkeys of sound stocks, to rear early summer-hatched poults which, after being rough dressed, have scaled within the lower weight demanded, and met with a ready sale at figures quite remunerative to the producer. The prospective turkey raiser must not imagine that the present-day trend for small birds means that he is expected to rear poults such as I have seen offered for sale on Christmas eve at as low as 3s. 6d. a head. But turkeys which attain 15 lb. to 18 lb. when fattened, and possess white skin and deep breasts, will always find plenty of buyers, while there is still a good private sale for much heavier birds.

Great care must be exercised in the selection of the stock for breeding, even though the sole object of the mating be the production of "killers" for Christmas rather than birds for use as future breeders. It is a mistake to choose those of the previous year's hatching, although for February broods some raisers do use such young birds, because they commence to lay earlier than matured hens. In its wild state the turkey does not attain maturity until it is two years old; hence no bird which is under that age should be put into the breeding pen.

Unfortunately, only too frequently young stock are bred from season after season; and it is largely due to this that some strains are lacking in stamina and are susceptible to disease. Stock hens should not be less than two years old, and the cock (known as the gobbler, and the stag) not under three years of age. The former are at their best as breeders during their third and fourth years, but many will do a fifth season; and cocks can be utilized for an equally long time. The weights will vary according to the breed, as, for instance, hens of 10 lb. to 12 lb. when fully matured and mated with male birds of 18 lb. to 20 lb. will produce the medium birds which at present are in more demand, while for the larger kinds the females should be 18 lb. to 20 lb. and the cocks 24 lb. to 30 lb. Heavier stock of the Bronze breed have been utilized, hens up to 24 lb. and cocks of 36 lb.; but, as a rule, the heaviest hens do not produce the greatest number of eggs, and particularly if they are weighty by being excessively fat.

FIG. 271. STOCK BIRDS

A group of Mammoth Bronze turkeys on a Bedfordshire poultry farm, maturing on free range for the breeding pen

Condition an Important Point

Condition, indeed, is an important point; and they should be active and bright-eyed, strong legged, firm fleshed, with deep breasts and long and straight breastbones and in good, hard, almost lean, condition. No matter whether it be cock or hen, the bird must carry plenty of breast, and be free of any trace of disease or any deformity. The laying power of the strain is also a matter of some importance because, although it is thought by some people that the turkey has scarcely improved as a layer since it ran wild, and that one or two lots of eggs in late spring is its maximum, there are turkey hens which will lay successive batches from March to June and

even into August. Such hens as these should be chosen.

One cock can be mated with eight to ten hens, although some rearers contend that the stag should not have more than six mates; but while such a number as the latter may be deemed sufficient for an average mating, one male bird will often fertilize twice as many, so much depending upon the individual and the care which is taken of him. Since it is well known among poultry specialists that one visit of the male bird will fertilize the whole of the usual batch of eggs produced by the hen, it is the custom in some districts for several breeders to club together for the purchase of a first-class stag for common use among them, while in other parts of the country turkey cocks are kept at stud, hens being allowed to run with them for a day only and then removed.

On no account, though, should the male be related to the hens with which he is mated; so, while it may be a great temptation to use for stock a particularly fine young cock which has been reared at home, it is much better, whenever it is necessary to get a fresh stock male—the cock should be fit for service for four or five years—to see that he is of an entirely different strain. If there is ample accommodation, it is a good plan to purchase half a dozen or so eggs on alternate years for the sole purpose of rearing a few sturdy young cocks of different blood to bring up on the farm for future stock; but they must be kept quite apart from the male which is being bred from, to prevent fighting.

Some turkey cocks become savage with age, and although they are not likely to attack their attendant more than once—if he gives them a severe clouting over the head at the first attempt—they may damage or unnerve the hens. This latter is not so apt to occur if the pen is permanently mated and it contains ten or even a dozen vigorous hens; but it is as well to keep an eye on them, and if he does unduly savage the hens, then he should be put into an enclosed run and the hens taken to him for a day as required. This is ascertained by the hens squatting about the run instead of perching during the day. However, there is seldom any trouble with a well-managed pen which is kept together for years; and I prefer to have them permanently mated than to isolate the cock.

Feeding the Adults

The stock birds must be hard and fit, and have lived an open life, even roosting in the trees in their growing or maturing stage, but it is not altogether a wise policy to leave them to find the whole of their food throughout the winter, no matter how wide be their range. On the other hand, it is a mistake to feed them heavily, and two meals *per diem* should never be exceeded, while unless exceptionally hard weather or snow prevails one will be ample. Until about the middle of February it should consist of grain only, and given in the afternoon; but after that time it can be alternated with wet mash, that is, grain one day and mash the next. The grain can be mixed, chiefly wheat, but with kibbled maize and sound barley and heavy plump oats, if these latter are obtainable at reasonable prices. About three parts of wheat and one part of maize will, nevertheless, suit the birds; and it should be put into a trough until the attendant has ascertained about the quantity required, although, as a matter of fact, all mash and grain given to our turkeys are put into troughs, simply because leaving any food on the ground is sure to attract rats. A couple of birds will require about three good handfuls of corn as one meal.

The mash can be composed of two parts of English barley meal, one part each of bean meal and Sussex-ground oats, and half a part of meat meal—all of the best quality—and worked up with about four parts of best middlings, these parts being by bulk, i.e. strike measure and not weight. At the beginning of the breeding season we also add cod-liver oil to the mash, at the rate of one pint to every 100 lb. of the ingredients, weighed dry. The soft food, which is only just damp, is never lumpy; and when it is prepared the quantity should work out at a very generous handful for each bird. The troughs should be heavy, so that they cannot be upset.

When dealing with the feeding of laying fowls, I remarked that one should feed with the eye as well as the hand; and never is this more necessary than when dealing with turkeys. The attendant who is a new hand will probably observe that the birds will prefer to range when liberated in the morning rather than take the breakfast he has prepared for them. If they show such a preference, let them indulge it, and cut the breakfast meal out altogether, because they are natural foragers, and the more they range the better will be their health and condition. During the breeding season most adult turkeys can be kept hard and fit, and the hens in lay, with one good meal of corn or mash *per diem*, and that given in the late afternoon. However, if the range of the breeding pen is restricted to a few acres, then two meals may be necessary; but do not so feed the stock that they "hang around the cook-house door" all day long, since they will get so fat that what few eggs they lay will probably be infertile. When allowing them two meals, let bran take the place of middlings in the mash suggested, and give it to them for their breakfast.

It is particularly essential, in such circumstances as these, to see that the cock bird gets his share of the food, neither wasting his time trying to impress

the attendant with his importance nor interfering with the hens while they are feeding. He can do all the strutting he requires when he has had a good meal; so, if he be either foolish or vicious see that he breakfasts alone. It is to get the birds settled down, however, that I advise putting the pen together in January, because bullied hens become so nervous of the male bird that they seldom take service; and, therefore, they produce clear eggs.

Nesting

If the management has been good, eggs may be expected in March; and that will be early enough for most purposes. February eggs are valuable when other than Christmas birds are required, while June chickens from medium-weight stock can be grown and fattened for sale in December. Since the turkey hen still retains some of her wild habits, and is, moreover, a most secretive bird, she may wander a long way to find a suitable nesting place on free range, and yet she may select one not far from her roosting quarters, but always where she can be concealed.

Some breeders fix up old barrels lined with straw and leaves, or they place thatched hurdles in odd corners, or put bundles of faggots or a few boughs against a wall. Such contrivances make good covers; and if the hens can be induced to lay their first egg in any such spot they will continue, provided they are not frightened off the nest by the attendant. They should certainly be encouraged to nest near home. Four of our hens refused such artificial nests; one chose the overhanging bank of a small pond which had been the playground of Aylesbury ducklings two seasons previously but which has developed into a nettle bed for want of water. Under a blackberry bush and among the nettles the eggs were regularly deposited—and collected. Another turkey hen found an excellent spot in the kitchen garden, against a thorn hedge and under the shade of a beech tree. A quantity of bean sticks had been dumped there when the beds were cleared—some amateur gardeners in the backlands are careless fellows—and the hen had crawled under the sticks and made her nest. A third found seclusion under a badly kept hedge of box, a 3 ft. by 2 ft. "border" between the kitchen garden and the orchard—the opening to her nest was scarcely six inches wide—while the fourth wandered into a neighbour's disused cart shed and produced her batch under some piled faggots. Strange creatures; yet in each case the eggs were carefully hidden under dead leaves.

The nests are not too difficult to locate by those who understand turkeys; and the understanding comes of observance. The hens generally begin to lay in March, some not until April, others in February. For some time beforehand they wander about uttering disconsolate notes and scratching holes in rough grass or under bushes; but since vegetation has not advanced much at that time of year, they can generally be spotted. Hence, as the laying season approaches, the attendant should provide nesting places, or keep his eyes open, because as a rule when the nest has been made by the hen she wanders towards it soon after being liberated from her night quarters at breakfast time; but she sits very closely when nesting, and one can pass within a foot or so without causing her to move a muscle.

The nest once being located, particularly if it be in the bank of a hedge or in a dry ditch where the herbage has not been thinned, it should be marked in such a way that it will not be overlooked a second time, but in a manner not likely to make the hen suspicious. As soon as she has returned to the flock the place should be visited, the egg—if any—removed, and a "dummy" left in its place; or if later in the season there are two or three eggs, leave one and mark it so that those which follow can be taken away regularly. On no account leave the nest empty or frighten the hen, because she will seek another spot which the attendant will probably have more difficulty in finding. The first batch of the season generally numbers from twelve to eighteen, sometimes more, although large numbers may be taken from one nest, because I have seen two hens sitting contentedly together, and both of them in lay.

Setting the Hens

Once the hen begins she will lay almost daily; and the greater number will be obtained by collecting the eggs as soon as the hens leave their nests, otherwise the birds will want to sit when they have produced about a dozen, or enough to form a nest. Those of the first batches should be set under ordinary hens, and the turkey broken of her broodiness before she settles down to sit, when she will commence laying again in ten days to a fortnight. She can be shut away in a strange place, like a broody goose which is being similarly "cured." Turkey hens are somewhat erratic when first becoming broody, in that for several days they will sit closely but at nights go to roost; and this does not have any prejudicial effect on the eggs, even if they are left in the nest. Other batches of eggs she produces can also be set under ordinary hens; and the record of these batches may be a larger one than the first—some birds have laid thirty and more at a stretch.

Turkeys may be permitted to sit late in May because, as the chicks will not appear much before July—the period of incubation is twenty-eight to

thirty days—her motherly care will be of great assistance to her brood in chilly autumn. Moreover, poults—as turkey chicks are named—seem to thrive better when with their own mother, needing her guidance in feeding, and her greater warmth at night, long after the common hen usually forsakes her brood. The novice might imagine that, with her long legs, she would be clumsy and apt to crush both eggs and chicks; but she crouches down with the utmost care and generally sits contentedly in the nest she has chosen. When she is utilized she should be lifted off her nest daily, and have food and water supplied to her. Eggs which are being incubated in a "natural" nest, one which the turkey hen has selected for herself, may be subject to pilfering; but this will not occur if the attendant has located the place and visits it regularly. At any rate, a hen which "hatches away" generally returns to the fold with her clutch of poults as soon as they are strong enough to travel; and such birds give the owner but little trouble.

Natural Hatching and Rearing

Of the various methods of incubation, the common old broody hen—and a hen, not a pullet—is the most satisfactory for the average turkey breeder to employ for sitting, although the turkey hens themselves may well be allowed to hatch the last batches of their eggs. Where large numbers of turkeys are raised, artificial incubation is often resorted to; and, contrary to what is generally supposed, the eggs can be quite successfully hatched in a good incubator by those who understand the running of such machines, the temperatures being slightly less than those for "hen" eggs, but allowing plenty of air during the cooling process after the first fortnight. In some cases the chicks are given to broody hens to rear; but progress is being made with artificial brooding, and results prove that it is possible to carry out the whole process artificially, the chicks being equal to those reared naturally. In this case, however, it is essential to put the eggs into the incubator before they are a week old, and not to open the machine from the time the eggs start to chip until the hatch is off. However, unless one is "in" turkeys on a large scale, the natural means of hatching and rearing are followed, while more than one raiser of my acquaintance, getting hundreds of birds ready for the Christmas markets, continues along the old lines. This is not surprising, because in early spring plenty of broody hens are generally available for the purpose, and the chicks thrive better in small than large numbers.

The object should be to get as many eggs as possible set in March and April, when large turkeys are required; but hatching may continue into June if there is plenty of suitable accommodation, and particularly with the medium-weight breeds. An ordinary hen will not cover more than nine eggs; hence it is advisable to set three hens at the same time, so that when the eggs are hatched there should be two good broods. A turkey hen will cover from fifteen to twenty eggs, some even twenty-five; and when she is the incubator she should be allowed to sit in her own nest, that is, the one in which she has laid. A quiet place, not too light, should be selected for the ordinary broody hens; and an earth-floored shed is ideal for the purpose. The nests must be carefully made and kept clean; and so, too, must the hen be kept free of lice. Nothing disturbs a sitting hen more than to be troubled with external parasites; hence she should be allowed to dust when off the nest, which she will do in the shed if part of the floor is loosened with a rake. The sitters should be treated in the usual way. Of course, if turkey hens are being set in a shed, they must have much larger nesting places than common hens, and plenty of air; but, while they are docile to handle during their brooding stage, they much prefer to sit on the nests they know, and they should be so indulged if they can be protected from rain. In any case, however, the setting hens, whether they be turkeys or barndoors, must be gently treated; and they should be disturbed as little as possible at hatching-out time.

The chicks hatch very rapidly and cleanly, if they are from eggs which were not more than a week old when set, and which had been laid by well-mated and seasoned hens; and in such circumstances the whole hatch will be off in from five to six hours. When they are just out of their shells, however, turkey chicks are nothing like as strong and lively as ordinary chicks; hence unduly to disturb the hen would result in some of the birds being killed. All that the attendant should do is to remove the empty shells, and allow the hen to come off only if she is restless; but it is much preferable, if it can be possibly managed, to give her a good meal before the first chick is hatched. The young should be left for the first thirty-six hours in the nest in which they were hatched, with the hen, because it is absolutely useless attempting to feed them, all they require being peace and warmth; and if the hatching has been done in a shed this should be an easy matter. Although particularly weak and feeble when first hatched, the poults will be quite strong if they are left undisturbed as suggested; and at the end of that time the hen and her brood may be safely removed to their rearing quarters. It is during the move that the full broods can be made up, because a good hen can easily hover ten chicks, although if plenty of appliances are handy each brood may be left as hatched.

Special Coops Required

The coop should be large, dry, well ventilated and rat-proof, and have a wire-netting and covered run to fit closely in front. And, no matter during what time of the season hatching takes place, the coop should have a board floor for at least the first fortnight. Unless the weather is wet or chilly, the coop and run should be put into a sunny and sheltered position where plenty of short grass and herbage are available. The birds are not difficult to manage, but they require to be understood; and with them the right thing done at the right time is essential for success. During rough weather a light dry floored shed, giving plenty of fresh air, will make a suitable place for the birds; but I prefer to rear them on short-cropped grass, because it is their favourite and natural diet. Instead of the ordinary open-fronted coop I prefer the roomy span-roofed kind, with bars at one end and a door at the other, the open end facing the sun. It can be 2 ft. 6 in. long, 2 ft. wide, 1 ft. high at the eaves and 2 ft. high at the ridge, because it will have to act as their house for some weeks; and nothing is worse than overcrowding the birds in stuffy coops. We always provide a warm floor for the first fortnight, and it consists of boards covered with a sack, since it is an easy matter to turn or change the sack to ensure cleanliness.

All coops which are used by us are fitted with fronts to keep vermin out at nights, and these fronts are made of $\frac{1}{2}$ in. mesh wire-netting on wooden frames to lift on and off. The bars for the turkey coops are wider apart than those in the ordinary chicken coops, almost wide enough to allow the hen to pass between them; and the runs which are attached to them fit closely and are topped with wire-netting, but they are seldom used after the first two to three weeks. When the chickens get accustomed to the grass run, the coop must be moved to a fresh patch every day. This is important, because cleanliness must be observed; and clean land should be set aside as the rearing quarters. It is as essential for turkeys as for pheasants; and many of the troubles met with in connexion with turkey raising are due to the mistake of attempting it on land which has been in constant use for poultry. They must have clean "sweet" land, and well drained, because damp quarters are detrimental.

Feeding and Managing Young Turkeys

I have mentioned the mistake of attempting to rear turkeys on other than fresh land, that which is free of poultry taint. Another mistake frequently made by those who do not understand this semi-wild species of poultry is in the feeding of the poults; and although it has been stated that during the first ten weeks of the turkey's life the bird has to be coaxed to live, I would not go as far as to say that such is actually the case. Nevertheless, they are apt to give the novice the impression that they really do not require anything to eat but would much rather be left with their own thoughts. No doubt that was why someone in the old days suggested that hatching a brood of common chicks at the same time as the turkeys and letting them mix, would teach them how to eat. Whether it will do so or not, I cannot say, not having tried it, although it strikes me as being quite unnecessary. As a matter of fact, turkey chicks are most lonesome little creatures, especially when in the charge of the ordinary hen, no matter how excellent a mother she may be; and they need personal attention, until they are sufficiently advanced to look after themselves. For the first two days, however, they should be left almost alone, because they require warmth much more than a meal; and any attempt to coax them to eat would probably agitate the hen to such an extent as to end in disaster. All that should be done is to see that they are secure from rats and other vermin, as well as one's own inquisitive dogs and cats.

When they are hungry they will eat; and provided the food is good, that it is given to them in a perfectly fresh and clean state, and at regular times, they will thrive. But they will take their food with much better appetite if their attendant stay to see them eat it than if it be merely dumped down for them and the birds are left to get on with it. They appreciate company, at any rate the presence of their feeder; and it has often surprised those who do not understand them to note how quickly turkey chickens respond to this little extra attention. It does more with them than with ducklings, goslings, or common chickens, although I find that gentleness is always appreciated by young stock. During the earliest stages of life turkey chicks require feeding regularly and sparingly every two hours, a little and often, because the crop capacity is particularly small; and although it may not be apparent at first, over-feeding is fatal. After three weeks the interval between the meals may be increased to three hours.

From the first, however, the birds should be regularly supplied with fresh drinking water; and if there is any doubt about its purity it may be boiled. This, nevertheless, I do not find necessary with water from the main. Some authorities advocate withholding water until the poults are a month old, under the impression that the birds get sufficient for their needs in the wet mash; but wet and sloppy mash is not such that turkeys appreciate, neither is it beneficial for them, and the correct form in which it should be

given is crumbly moist, or even dry. During the first two or three weeks no food of a bulky nature should be supplied to them; and if barley meal is used, which I do not advocate, then it should be passed through a very fine sieve before being mixed in the mash.

Special Mash Mixtures

With regard to the food, it is very many years since I have provided young poultry with egg in any form, whether hard-boiled, raw, or scrambled, because the use of it, in my opinion, leads to trouble; and with turkey chicks particularly it seems to be most objectionable. I have started them with stale brown bread or finely granulated biscuit meal soaked in boiled skim milk and squeezed almost dry, with Sussex-ground oats, oatmeal, boiled wheat and rice, and other foods; but I must admit that, since coming into line with modern methods and adopting a rather more elaborate mixture at a slightly increased cost, the results have been such that I have not regretted it in the case of turkeys reared for stock, while the food of those destined for market was changed at five months and a fattening diet provided. The mash mixtures used are as follows—

	1–8 Weeks	8 Weeks to Maturity
Mash Ration:		
Biscuit meal	10 parts	—
Sussex-ground oats	20 ,,	—
Maize meal	10 ,,	40 parts
Bran	20 ,,	40 ,,
Middlings	30 ,,	80 ,,
Meat-and-bone meal	10 ,,	15 ,,
Cod-liver oil	1 pint	—
*Mineral mixture	—	8 parts
Grain Ration:		
Wheat	1 part	2 parts
Kibbled maize	1 ,,	1 part
(All parts by weight)		

*Composed of—

Ground limestone	2½ parts
Sterilized steamed bone flour	2 parts
Common salt	½ part

Any well-known proprietary mineral mixture may be used.

The mash is never given in an absolutely dry state, but always damp, some care being needed in its preparation, while it is made freshly for each meal. This is the rule with all mash which is supplied to the turkeys, since even the adult birds do not relish wet, sloppy, lumpy or stale mash. Before the end of the first week the food is flavoured with onion, beginning by preparing it with water in which a small piece is boiled, afterwards including in it very young scallions or "spring" onions—those which do not "bottom out" but remain with a stem like a leek—and subsequently, when they are not obtainable, any onions (garlic, chive, shallot, etc.) which happen to be available, raw and finely chopped. After the first few days the grain ration is started in the form of cracked wheat, which is given to the poults with the last meal, a small quantity of it being put down in the mash. Cracked wheat and finely kibbled maize are allowed as one meal, and eventually whole wheat and kibbled maize are used.

Fig. 272. Bronze Turkeys
A few second-season birds selected for the breeding pen

When changing over the mash mixture, the biscuit meal and Sussex-ground oats are gradually reduced and the maize meal, etc., increased, since it is unwise to make any sudden changes. When minerals enter into the diet, flint grit and oyster shell are discontinued; hence any grit which the birds may require is picked up by them from the range. At five to six months old no more than two meals are given daily, and sometimes only one, according to the weather and the condition of their range; and when one is supplied we prefer to allow mash and corn on alternate days. I have found it better to continue with the same food mixture right through rather than to keep changing it, since it ensures a steady rate of growth, changing only for fattening, four or five weeks before Christmas. One season we had a late brood, the chicks not being hatched until 2nd July, but the diet as above was given from 4th July, and although the summer and autumn were abnormally dry and hot, the birds turned out satisfactorily, the young cocks scaling up to 16 lb. for Christmas, and the pullets —ranging freely and unmated—commencing to lay early in the following March, that is, while they were less than nine months old.

Green Food Essential

If plenty of good grassland is not available then the poults must have a liberal amount of fresh green food, the best being dandelion and dock leaves, lettuce,

and endive, as well as the trimmings of onion beds, raw and finely chopped, although the first growths of the common stinging nettle (lightly boiled and minced) are also appreciated. All green food must be young, tender, and fresh; and none of it should be left to wither and dry in the sun. They should have it at least once a day, because green food is essential for them. On no account should sour food be given to turkey chickens; hence, at each feeding time, only enough should be supplied to allow them fifteen to twenty minutes at the boards or the troughs, the attendant putting down not more than half the ration at first and adding the balance when it is cleared. Should any remain, however, it must be removed or given to the hen—she will require one good meal daily—and the trough cleaned and stood upside down on the coop. Scrupulous cleanliness must be observed in all matters; and it is advisable periodically to examine the birds—the hen as well as the poults—to see that they are quite free from lice, which are the cause of many fatalities. Lice frequently congregate around the head; so should the birds at any time appear to flag for no apparent reason look for lice.

Very careful attention is necessary until the young birds have "shot the red," which they do when from eight to ten weeks old. When they approach the size of partridges the granular fleshy excrescences on the head and neck begin to appear, and they then put up the red wattle on their throat, soon after which time their whole plumage, especially the tail feathering, starts into rapid growth. This is a critical period for the birds, since neglect at such a time may result in disaster. It is generally at the age when they commence this process of shooting the red that the hen thinks about leaving her rapidly growing chickens. Hence it is advisable to transfer them from their coop to a dry out-building facing the sun, and to bed them down on straw; or to give them a house on low wheels, if they can have the range of stubble fields, so that when such land is ready for them they will have got accustomed to their sleeping quarters and be the less likely to pass their nights outside, where they may be the victims of a marauding fox. They may have complete liberty when about ten weeks old; but the attendant must see them safely to bed and be very careful to keep their range free of foxes and other vermin. Until they are of such an age they should be kept where they cannot stray far from their house.

Prevent Chilling

It is not advisable in the early stages to let the hen out with them to wander at will, except during particularly fine weather, and then only where the grass is short, because in their earliest days even walking through long wet grass may bring on chilling, while a heavy downpour of rain is sometimes fatal. When they are first at liberty it is as well to allow them to be within easy reach of shelter, in case of sudden storm, although when they are fully feathered rain will have little if any effect on them, and they may safely perch out at nights—if their ground is vermin-free. As soon as a field of corn is cut and carted, the birds should be moved on to the stubbles, and their house shifted to a fresh patch every day or two. They

FIG. 273. A FIELD HOUSE FOR YOUNG TURKEYS

This small house—home-made in sections and bolted together—provided ideal night quarters for a brood of young turkeys when first put on free range from the rearing ground. As soon as the birds had shot the red, the trap-door was permanently closed, one side removed, and the house swung around so that the open part faced south. It has a wooden floor (movable) well littered with straw, and its dimensions are: Length 5 ft. 3 in., width 4 ft., height to eaves 2 ft. 6 in. and to ridge 4 ft. 4 in.

will probably require only one meal *per diem* to keep them growing; and they should be allowed to remain on the stubbles as long as there is any corn for them to pick up, or until the ground gets wet and cold, when those which are to be fattened should be moved to their winter quarters.

The great thing throughout the rearing of turkeys is to protect them from wet and cold in their earliest days, and especially wet; and yet, somehow, I should not like to rear them intensively. They require feeding regularly with sound food, the mash being prepared freshly for each meal; and the attendant should be strictly up to time, because they do not relish being neglected, and are apt to go back if overlooked. Their food and water vessels should be kept clean, and their sleeping quarters also. They are not big eaters at first, in fact not before they have "shot the red" do they find their appetites when, until they are eight to nine months old, they consume enormous quantities of food, a large proportion of which should be vegetable, otherwise the cost of their keep will make them a luxury. During the early weeks of their life, therefore, they should be fed "little and often," but at the

start two-hour intervals will be ample. They are the progeny of big birds and require plenty of room and air while they are sleeping, so that a small boxed-in coop is no place for them; and since they grow rapidly they should not be overcrowded on the land. In such circumstances they will thrive with little change of diet, since the herbage and insects they get will provide them with all the variety they require; and they should never be tempted with dainties. When they are ranging, provide them with ample shade. They are hardy if properly managed and are bred from sound stock.

Perching

And that brings us to the question of perching. At what age they should be permitted to perch at night instead of sleeping on the floor is a moot point. Some breeders appear to imagine that early roosting results in crooked or dented breastbone; and such a blemish does detract from the appearance—and the price—of the bird when dressed for market. However, as it is many years since I worried about how soon my ordinary chickens took to the perches—in fact, they are encouraged to do so at the earliest possible date, to prevent overcrowding and packing into corners—so it is with the turkeys. They are strong enough at ten weeks or so to balance properly and sleep comfortably off the ground; hence, as soon as the coops are dispensed with and large quarters are provided for them, they take to the perches. As a rule, some cluck hens and a few bantams share their range; so they roost up quite naturally on the broad poles provided for them.

Maybe the small birds show them the way; but the odd fowls with them do seem to prevent them wandering too far from home until they are well advanced. As it is, our turkeys seem to imagine that all places are free to them, because during the day some will perch on the garden gates or sun themselves in an old apple tree. They are hardy enough to sleep out at night; and they should do so, except that, despite game-keepers in the neighbourhood, and our own dogs, the farm is within the range of Reynard. Moreover, the district has been visited at night by those who take that which they have not produced; so all our poultry stocks are shut in at eventide. Turkey chickens are easy enough to rear when their ways are understood; and they are worth studying, since, apart from their value as foodstuff, they are most interesting birds.

Fattening for Market

These are the days of small joints; and the greatest demand is for medium rather than large turkeys. This does not mean, however, that lean and hard birds with little or no flesh on them are likely to meet with a ready sale. They must have well-filled keel-bones, plenty of breast meat, and withal some fat to give them the requisite plump appearance, and, moreover, to enable their being fit to eat when roasted or baked, since meat without fat is tough when taken from the oven. They do not require to be fattened like the Christmas goose of old, or even to the extent of the turkey of twenty years since. Nevertheless, they want special feeding for the occasion. As a rule, though, the process is not of such duration as in the days when consumers were proud to boast of a 25-lb. bird on the festive board, and when the "growers" began the fattening of their stock at the end of September.

Healthy young birds which are well meated—and it is useless to attempt fattening merely a frame—can be got into prime condition in a month, and particularly if they have been on the stubbles and kept up to that condition by hand feeding when the stubble fields have been gleaned by them. This means that after they are moved into their winter quarters around the farmstead, they are provided with one meal a day until about mid-November, when they get two meals of wet mash at regular times. This can consist of equal parts by weight of pure English barley meal, Sussex-ground oats, and good toppings or middlings, prepared with skim milk, or in lieu thereof warm (not hot) water and 5 per cent of mutton fat. Maize meal has been used instead of barley meal, but it has a tendency to produce yellow fat. Mix at a time the amount required by the birds as one meal, and no more; but if any mash be left, use it at once for other stock and do not offer it to the turkeys at their next meal. Clean the mash troughs after each meal. During the last fortnight, after they have had as much of the mash as they will eat, let them finish (morning and evening) with wheat from the trough. Do not leave food before them all day, but keep flint grit in a trough in a place which is always accessible to the birds.

Low Perches Desirable

Some farmers bring their birds in to fatten, confining them to a barn or a shed; and, while they can be fattened in the open, it is decidedly preferable to keep them where they cannot roost high. They must be fed and housed by themselves, but not singly, because it is almost impossible to fatten a turkey by itself. They give better results when in flocks, and as many as two dozen to thirty can be kept together. If there be any beams in the building, prevent the birds roosting on them, since, as they will fly down from them each morning, they will in all probability bruise themselves and thus be rendered valueless as market-

able produce. As they put on weight their legs "give" under them on contact with the floor.

Perches in the house should not exceed 2 ft. from the ground and be made of 6-in. planks, with rounded edges, and well supported underneath, to carry the great weight put on them. The birds should be allowed to lie or walk about on straw in an open yard during the day, being confined only at night; and before leaving them see that they are all on the

FIG. 274. AT THE FOOD TROUGH

A flock of young turkeys having their evening meal from a substantially-made trough. These birds were on a wide range until they were required for fattening for Christmas

perches. Once a week, feel their crops to ascertain that they are full. Keep the house clean; and, above all, take every precaution against rats. Feed the turkeys at regular times, say at 8 a.m. and 4.30 p.m.; but see that they have breakfast as soon as they have stretched their wings, and let them have their second meal at sundown or about an hour before they are ready to retire to their sleeping quarters.

All the food should be supplied in troughs, V-shaped, and with ends and cross legs, the top about 9 in. from the floor, so that the turkeys can reach their food without pressing their necks on the sides. Grain should never be thrown on the ground when given to the fatteners; and each trough should be long enough to contain sufficient mash for the whole of the birds. Special care has to be exercised; and, in the matter of feeding, much has to be learnt from experience, and from close observation of the birds. They must be fasted for a whole day prior to death. Plucking has to be particularly well done, because the skin can be easily torn, and the carcass would then be disfigured; and the salesman at least would consequently return a less price for it.

Intensive Hatching and Rearing

I have remarked that artificial incubation is often practised, while progress is being made with artificial brooding; and an experiment conducted in 1934 at the Lancashire County Farm School, Hutton, proved that turkeys can be kept strictly intensively from the time they are hatched until they are marketed at Christmas. Whether the cost of feeding and managing the birds under those conditions was such as to prove a sound business proposition I am not prepared to say; but some particulars in connexion with that experiment are well worth recounting. The method is perhaps not likely to appeal to the average turkey raiser, since most of the birds are kept on farms, where they obtain a considerable quantity of free food while they are ranging; and with stock which can exist at certain times of the year on herbage, with little hand feeding, this is a great asset and enables their owners to realize the maximum of profit.

Briefly, then, it may be stated that, in the experiment in question, 100 eggs were put into a 150-egg size hot-air incubator, in which the temperature was 102·5° F. rising to 103·5° F. in the last week of incubation, the fertility being 60 per cent and the hatchability 90 per cent. The poults were transferred to a brooder house, the front of which allowed the maximum of direct light, the house being divided into six sections, each 9 ft. by 6 ft. The day-old poults were put under a 150-chick size pyramid hover, heated by a double burner paraffin lamp, and the heat was gradually lowered so that it was dispensed with at one month. As the poults progressed they were divided, until at sixteen weeks of age they (fifty-four) occupied the whole six sections of the brooder house. The floor space when the birds were put in (25th May) was 1 sq. ft. a head, increasing to 6 sq. ft. at six weeks; and at the end of sixteen weeks, to prevent overcrowding, the flock was reduced to eight cockerels and twenty pullets, and kept intensively. They were divided according to size, four or five in each section, so that each bird had an average of approximately 11 sq. ft. The windows of the house were kept almost continually open both day and night during the early months of rearing, and the floor was littered with peat moss tailings.

Up to sixteen weeks of age the turkeys were fed entirely on dry mash, except the first two days, when the mash was moistened and given as five meals daily on flat boards; otherwise a 3-ft. hopper was provided for each section. From sixteen weeks onwards wet

mash was given twice daily, with an occasional meal of grain at night. The rations were as follows—

	1–8 Weeks	8–30 Weeks
Mash Ration:		
Maize meal	49 parts	45 parts
Bran	14 ,,	21 ,,
Thirds	14 ,,	21 ,,
Soya bean meal	7 ,,	—
Dried skim milk	7 ,,	—
Fish meal	7 ,,	7 ,,
Common salt	1 part	½ part
Cod-liver oil	1 pint	1 pint
Ground limestone	—	2½ parts
Steamed bone flour	—	2 parts
Grain Ration: (after 16 weeks)		
Wheat	—	2 parts
Kibbled maize	—	1 part

Green food was supplied *ad lib.* in the form of kale; cut dandelions were given when the poults were very young. At two weeks of age, separated milk was gradually introduced, so that at eight weeks old the poults received only separated milk to drink, and this replaced the soya bean meal and dried skim milk in the ration. Oyster shell grit was always available.

The birds made excellent progress, averaging 17 lb. 10 oz. at thirty weeks of age; and the results obtained indicate that "definite advantages are to be gained by rearing turkeys intensively up to sixteen weeks of age, or even for the whole period up to marketing. They are less liable to blackhead infection after 'shooting of the red,' which occurs before twelve weeks of age . . . There were no losses up to sixteen weeks of age, and no loss occurred during the whole period among the intensive birds."

It may be mentioned that, when the flock was divided at the end of sixteen weeks, one group, of twenty-four cockerels, was put on free range. These birds were provided with one large mash hopper; but at twenty-four weeks of age they were given a fattening ration, twice daily, consisting of Sussex-ground oats, maize meal, and thirds, one part of each, and mixed with skim milk, with an occasional meal of grain at night. All the turkeys were in excellent condition for the Christmas market.

Truly, we are changing our methods; and yet, intensivism for the turkey cannot appeal to those who look on this bird as the most interesting of our domestic varieties of poultry. Some of us derive pleasure from watching a brood of youngsters strolling along a hedgerow, leisurely searching for insects and constantly uttering their peculiar cry, and in autumn noting the flock of well-grown birds wandering in their own majestic style over the stubble fields, gleaning corn and picking up the oddments which come their way.

All my life I have associated the turkey with the wide and open spaces, even though the gobbler may strut around the stackyard or paddock in springtime as though the earth were made for him and his alone. Indeed, he is king of the poultry yard; and to condemn his progeny for their brief life to the confines of a brooder house . . . let others do it, I could not have it on my conscience.

CHAPTER XVIII

POULTRY DISEASE AND HOW TO CONTROL IT

POULTRY can be kept perfectly healthy if they are properly managed. At least, that is my opinion, backed by close upon half a century of practical experience in poultry-keeping. Most ailments can be avoided by careful management and strict attention to the rules of health; and those who would keep such stock successfully will be wise to act on that sound old Roman maxim: Learn to prevent disease by proper management.

Ever since the service of the scientist has been enlisted for assistance in the solution of some of the problems of the poultry industry, it is generally agreed that disease prevention is more important than cure, possibly because in the fowl, as opposed to the human, it is not a sound policy to patch up the unfit in order that they may perpetuate their kind. As it is, the aim of the poultry pathologist is to prevent disease rather than to develop a method of treatment, and this in view of the fact that knowledge of disease has been considerably advanced during the past few years. Laboratories are able to render very valuable assistance; but this one fact stands out—poultry-keepers themselves can do most in preventing heavy losses from disease by exercising care in the management of their stocks. Research workers are demonstrating in their own thorough way what experienced breeders of old have learnt from practice, that most diseases are due, primarily or secondarily, to mismanagement.

Some Do's in Connexion with Management

The steps to be taken to ensure healthy poultry have been fully dealt with in the preceding chapters; but it may be beneficial if I refer to them briefly. The novice in poultry-keeping is generally reminded of things he should not do; but, since it is said "a shingle is never so thin but that it has two sides," I will tell him of two or three things he should do. Breed only from perfectly sound and seasoned birds; avoid pullets or immature females, unless the object be breeding solely for market, in which case the whole of the progeny will be killed for consumption and none used for stock.

When purchasing stock, whether in the day-old or growing stages, for egg production or the breeding pens, insist on their being disease free. Accommodate them on hygienic lines, in well-ventilated and clean quarters; observe strict cleanliness at all times and in all things. Avoid overcrowding, from the brooder stage to old age, at night and during the day. Provide well-drained and "sweet" land, ample shade from the broiling summer sun and adequate protection from winter's winds and storms. For the insides of the houses, including the nest boxes, use hot limewash at least twice a year; if thoroughly applied it will destroy both animal parasites and micro-organisms, while its disinfecting power may be increased by the addition of 4 oz. of carbolic acid to each gallon of wash.

When a disinfectant vapour is required in order to reach the ceiling of houses and the fittings of brooders, either formalin or sulphur vapour will be found efficacious. The formalin may be sprayed over the inside of the house or brooder in a 4 per cent solution; and if the door and windows be tightly closed so that the vapour will be confined, every part of the interior of the structure will be disinfected. To employ sulphur it is advisable to obtain the substance in the form of a sulphur torch or candle, which should be ignited and placed in a tin basin and allowed to float in a bucket containing water. Always keep grass runs closely cropped or mown, and earth runs occasionally dug over or ploughed in order to bury the accumulated excrement, and at the same time bring fresh soil to the surface. If this does not prove sufficient for the purpose, saturate the soil with any germicide which is guaranteed stronger than carbolic acid. To disinfect pools of water pour a quantity of paraffin oil into the water so as to form a thin film on the surface. Examine the excrement occasionally, especially that which is voided during the night, since worms can generally be detected by such means.

Give the birds sound food, and feed them regularly; select a fresh feeding patch daily, if possible, and always clear away any food which remains in the evening, especially cabbage or other greens provided for fowls in confined runs. Above all, feed with the eye to detect trouble in its very earliest stage.

Cultivate the habit of close observation, and study the birds as something worth while. Handle them to know the feel of healthy muscles, the natural warmth of their skin, the texture of their plumage, the contour and position of their bones, the colour of their eyes, the normal method of their breathing, their weight; and get acquainted with their appearance in health, their movements and habits, and the like.

Prompt Action Necessary

Act promptly on the slightest sign of indisposition, and isolate the sick if merely to prevent their being

bullied by others. Have an isolation pen well away from the flock and 3 ft. to 4 ft. off the ground, so that there will be no chance of diseased droppings or food being carried on one's boots. Keep it whitewashed and disinfected. Consult a specialist if the case is beyond you, and follow his instructions even if he advise wholesale slaughter; burn the dead or bury deeply in quicklime out of the reach of dogs, cats, rats, foxes, or other animals. Put into quarantine all freshly purchased stock which have to mix with others, as well as any of the home birds which have returned from a show or from a prospective buyer.

Should the poultry-keeper have the great misfortune to experience abnormal losses in a flock, arrange for a post-mortem examination. And do be wise enough to recognize that post-mortem examinations are essentially the work of specialists who have devoted years of study to the subject; they are of too intricate a nature to be undertaken by the novice. Diagnosis, or distinguishing one disease from another, is of prime importance in dealing with disease; one must know the malady before adopting a reliable treatment for its suppression or cure. Unless the knowledge is accurate or scientifically correct, it is of no value; it may not only be valueless but dangerous to those who use it. Leave specialists' work to the specialists, and concentrate on the prevention of disease.

Observe Sound Management

Good care is the only known guide to success with poultry; and in respect of them, as in respect of himself, the owner should exercise good, sound common sense. Healthy poultry, like healthy people, do not need medicine; it is time enough to commence doctoring when sickness makes its appearance. Routine medical treatment as a preventive of disease may appeal to some people, but it is not necessary, except perhaps in the case of laying hens which are kept where they cannot get the correctors which Nature provides in a grass range; and in such cases it has proved beneficial throughout the productive season to give the birds monthly doses of sodium sulphate solution, as well as an iron tonic, such as ten grains of sulphate of iron in each gallon of drinking water.

Some authorities advocate that all species of poultry should be de-wormed at least twice a year—in spring and autumn—and yet I have never found it necessary so to treat any stock I have kept. There are poultry-keepers who imagine that hens require tonics on wet and raw days to warm them up, and in this direction suggest the use of cayenne or ground black pepper; but well-managed fowls will keep themselves warm enough by exercising for cold grain thrown where they must use their feet to get it. Periodic de-lousing has also been mentioned as part of routine medical treatment; but good management obviates it. Routine sound management is what the poultry-keeper must observe.

And just one "don't." Do not imagine that poultry cannot be kept perfectly healthy unless their owner has a complete knowledge of poultry disease, including symptoms and treatment, or that to be a successful poultry-farmer it is essential to undertake a course of technical training on the subject of disease, and qualify as a scientist, a pathologist, or any other "ist." If the poultry-keeper possess such knowledge, complete in every detail, he will probably be keeping poultry as a hobby or for experimental purposes rather than as a commercial proposition. A general knowledge of the subject is often useful in determining the cause of death when a bird is found on the range or in the house, and if the disease were contagious might prove highly practical in guarding the rest of the flock against its attacks; but it is not essential for success.

I have no intention in this chapter of dealing with every disease which has been known to occur in poultry, since it would be of little use to the practical poultry-keeper, while some diseases are of very rare occurrence and others cannot possibly be cured. There are laboratories devoted entirely to poultry subjects; and when an outbreak of disease does occur, those who have had previous technical training should be consulted, because they are best qualified to give a correct diagnosis, and render valuable aid. Personally, I should not hesitate to attempt treatment of every case of sickness which came under my control, no matter how hopeless it might be; but this would be done, as it has been done, solely for experimental purposes. Breeders generally find it more humane—and certainly more economical—to kill a very sick bird rather than to attempt treating it; and in this matter the poultry-keeper must use his own discretion, since in the fowl, as I have already mentioned, it is not a sound policy to patch up the unfit in order that they may perpetuate their kind.

Special Treatises

However, readers who wish to delve deeply into the subject—students, instructors, or lecturers who would be well read in this branch of poultry science—are able to get some very useful information from special treatises; and among them I suggest "Poultry Diseases," by Henry Gray, M.R.C.V.S., an excellent handbook, written in simple language; "The Common Ailments and Diseases of Poultry" (illustrated), by Leslie Pearce-Gervis; and "Poultry Disease," by B. F. Kaupp, B.S., M.S., D.V.M., a technical work published in America, and treating also of the anatomy

and physiology of the fowl. Another book in which anatomy is fully dealt with is "The Structure of the Fowl," by O. Charnock Bradley, M.D., D.Sc., M.R.C.V.S., which includes a chapter on the development of the chick, and which will also prove serviceable.

The similarity of the symptoms of various diseases renders it very difficult for the novice to determine the particular ailment from which a bird may be suffering. For example, "going light," a popular term among poultrymen for loss of weight, is a common symptom in many diseases, such as aspergillosis, avitaminosis, debility, tuberculosis, and verminous infestation, and also constitutes a malady of itself, viz. asthenia; yet the exact disease is often difficult to discover without a post-mortem examination. Lameness may arise from too rapid growth of young stock, from paralysis, cramp, a rheumatic or gouty affection, biliary trouble, swelling of the ball of the foot, or from some bruise. Giddiness or staggering may be due to apoplexy, gastro-enteritis, acute indigestion, intestinal worms, nervous affection, infectious disease, poison, and so forth. Yet again, some diseases do not give clear special indications, or any indication, and only a post-mortem examination would determine the cause of death. Suffice it, therefore, to mention those troubles—ailments, accidents, so-called "vices," etc.—with which the novice should be able to deal successfully.

Simple Troubles and Their Treatment

CALLOSITIES—(Breastbone abscess). Through constant perching fowls are somewhat prone to a peculiar growth in the region of the breast (a callosity), the usual size of which is about that of the area covered with half-a-crown.

Cause. Constant pressure of the bone on an unsuitable resting place, as, for instance, a hard floor, or a perch which the bird is unable to grip in such a way as to roost normally; at times due to leg-weakness preventing the proper balance of the body, but in this case frequently coinciding with soft bone formation and resulting in dented or crooked keel-bone.

Treatment. The best way to liberate the fluid contents is to paint the external parts of the callosity with tincture of iodine, then puncture the skin with a medium-sized needle which has previously been heated with a lighted match until the point of the needle is a dark blue colour. This precaution precludes the possibility of any after-effects which might be due to the employment of a none too clean needle. When the skin is punctured pressure should be used to empty the bladder-like area which surrounds the callosity. The application of iodine or of boric ointment is all that is necessary to complete the treatment of the wound. Allow the bird its liberty but bed it on clean straw. If the trouble is the result of leg weakness or soft bone, kill the fowl for the table. As the callosity is attached only to the skin it in no way interferes with the preparation of the fowl for edible purposes, as the skin can be cut away and the underlying flesh remains intact.

CATARRH OR COMMON COLD. *Symptoms.* A watery secretion from the eyes and nostrils, with general weakness, together with a material rise in temperature. Very often great difficulty is experienced in breathing, due to the watery secretion obstructing the air passages; and when the affected fowl draws a breath it is accompanied by an audible rattling sound.

Cause. Insufficiently ventilated roosting places, exposure to draughts, overcrowding at night, damp litter.

Treatment. Isolation in a dry, light, and warm chamber which is free from draughts. Give the sufferer one 3-grain tablet of quinine sulphate, twice daily. Squeeze the bird's nostrils to remove as much moisture as possible, and swab out; the nostrils must be kept clear. Good results are obtainable when the air passages are treated with medical vapour, and a simple way to do so is to administer one eucalyptus and menthol pastille. As soon as the bird swallows the pastille and the latter slowly dissolves in the crop, a medicated vapour is generated which penetrates every air channel. The quarters from which the affected fowl has been isolated should be disinfected, and the drinking water of the flock treated with a small quantity of aromatic sulphuric acid, one teaspoonful (one fluid drachm) of the acid to one pint of drinking water; make sure that aromatic sulphuric acid and not ordinary acid is obtained. It is also an excellent precaution to tie up in their quarters small wads of cotton wool—about 4 ft. apart, the whole length of the house, so that they swing a few inches in front of the perch and on a level with the birds when they roost—and to put a drop of eucalyptus oil on each wad in the evening. Above all, however, see that the fowls sleep out of draughts, although in a fresh atmosphere; and caulk any cracks or knot holes in the sides or back of the house. And avoid back (eaves) ventilation.

CORNS: BUMBLEFOOT. The corn is closely related to the callosity; there is friction, but it is associated with compression. The condition known as corns is an inflammation and thickening of the skin on the under surface of the foot, the result of prolonged pressure, irritation, and bruises. Bumblefoot is an aggravation of that condition and is seen in those cases where the irritation and bruising are most severe or prolonged.

Symptoms. In a case of bumblefoot the affected part is hot, painful, and more or less swollen. Sometimes an abscess may form, and the joints may be inflamed owing to the suppuration products gaining access through the channels formed by the abscess.

Cause. The condition may be caused by heavy birds flying from their perches and alighting upon a hard surface. Poultry runs containing ashes are specially suitable for the production of cases of bumblefoot, as the fowls are compelled to stand continuously upon a hard, unnatural substance in lieu of the yielding, elastic, non-jarring earth to which they have claim, if only from a humane standpoint. Suitable precautions should be adopted to prevent the development of bumblefoot. The perches should be placed at a reasonable height, and the floor upon which the birds descend should be covered with litter or earth, so that the feet will not be bruised.

Treatment. Soak the feet in warm water in which has been dissolved sodium carbonate (common washing soda), one dessertspoonful in a pint of warm water. If an abscess in the ball of the foot is indicated by a fluctuating soft swelling, it should be opened with a clean sharp knife. After expressing the contents of the abscess—do not attempt to remove the callosity underneath the foot—swab out with iodine, which apply every third day until the wound disappears, in the meantime keeping the bird on clean straw.

CROP BINDING. *Symptoms.* Abnormally large and sometimes hard crop, general depression, disinclination for food, increased thirst but inability to swallow water. On handling such a bird its crop—in front of the fowl—may be larger than a cricket ball and almost as hard, while liquid will flow from its beak.

Cause. Mechanical obstruction owing to indigestible matter causing food to accumulate and thus prevent its natural softening. Eventually the mass blocks the outlet from the crop; and unless relief is given the sufferer will starve to death. Most cases of crop binding are due to the bird eating fibrous grass, hay, straw, etc., along with or in lieu of other food, owing to carelessness or mismanagement on the part of the attendant.

Treatment. Unless the contents are hard, which can be ascertained by handling, a milk diet for four days to a week should prove effective. The fowl must be isolated in a coop with a slatted or wire-netting floor, without a particle of litter, and given nothing but full milk—no grain, meal, greens, scraps, or water, just milk. The crop should not be massaged but the sufferer left entirely alone, merely seeing that plenty of milk is available. However, if this should fail, the mass will be of such a nature as to necessitate the opening of the crop and the removal of the obstruction. This operation is a very simple one in the hands of a specialist, but somewhat difficult for a novice; and he will be well advised to see it done before attempting it himself.

Have ready a lancet, a small surgical needle threaded with about 6 in. of white silk smeared with vaseline, a small sponge (or cotton wool), a rubber glove for the operating hand, a teaspoon, and a shallow bowl of disinfectant solution, into which place the instruments. Fix the bird up as described for caponizing; or, get an assistant to hold it firmly by its wings (near the shoulders and over the back) and legs, to prevent struggling, and facing the operator, which is preferable to lying it on its side.

Pluck a few feathers covering the crop to ascertain the position of the blood vessels, which should be avoided, and wipe with the disinfectant—I use a mixture of iodine and methylated spirit before puncturing skin or cutting into live flesh. Then with the lancet make a clean cut about 1 in. long, and downwards, over the top part of the swollen crop, through the outer skin and the wall of the crop. Through this opening withdraw the obstruction, first removing any liquid by means of the spoon. When empty, which can be ascertained by inserting a gloved finger, wash out with the disinfectant solution and close the incision by sewing it. Do not attempt to sew the crop first, and then the outer skin; sew the inner and outer walls together—and use a single thread for the purpose, not each stitch knotted—so that the usual products of suppuration will not gain access to surrounding tissue but will form on the outside of the wound, from which they can be removed. Sponge the exterior of the wound and return the bird to the coop, bedding it on clean straw. For the next week provide it with a light semi-fluid diet, such as bread and milk, in which mix a pinch of sodium bicarbonate the first day; or give it a draught by means of a syringe—2 grains bismuth subnitrate and 1 grain sodium bicarbonate dissolved in a tablespoonful of warm water. Remove the stitch when the wound is healed. The object of making the incision high on the crop is to prevent the wound being exposed to food.

DIARRHOEA. *Symptoms.* More or less fluid motions, copious in quantity, and offensive in smell.

Cause. An inflammatory condition of the digestive canal resulting from crop binding, from too stimulating food, from drinking polluted water or eating mouldy, tainted, or unsound food. With the advent of sudden cold or hot weather there usually occurs a mild epidemic of diarrhoea among fowls; but it is not necessary immediately to begin dosing a bird if a little looseness is noticed in the droppings, because this looseness may be just what the fowl needs to remove some deleterious food, and is better left alone.

Treatment. When treating fowls affected with diarrhoea it is essential that the cause of the malady be removed. Therefore, if the food is at fault, the remedy lies in employing foods which are reliable; the drinking water supplied to the birds should be clean and fresh, and the container washed out daily. Removal to dry and warm quarters is beneficial for special cases. The diet should be reduced and confined to boiled rice, while a small box of granulated charcoal should be kept handy. If the trouble persists, a specialist should be consulted or the bird killed and sent to a laboratory for post-mortem examination.

"DOWN BEHIND." This is one of the expressive terms coined by poultry-keepers. It indicates that a hen—seldom a pullet—is unusually low at the stern, that, in fact, her abdomen is abnormally enlarged, almost touching the ground and giving the fowl a waddling and duck-like appearance. Unlike waterfowl, hens in full lay, normally, do not alter their gait, although the depth between the ends of the backbone and keel-bone is increased.

There are several causes of "down behind," but only in one instance, viz. egg binding (*q.v.*) is treatment advisable. The others, such as Abdominal Dropsy, Pendulous Abdomen, Cystic Disease of the Ovary, etc., are beyond ordinary remedies. Ascites (dropsy of the peritoneum) can be relieved by tapping, by inserting a hollow needle or trocar through the skin and muscles of the abdomen into the cavity, and allowing the fluid to escape; but since such a bird should never be bred from, and its flesh is not fit to eat, it would be waste of time to treat her. Pendulous Abdomen may be caused by excessive accumulation of fat in the abdominal cavity, or by weakness of the abdominal muscles causing the internal organs to fall out of place, or by "egg tumours"; but while strict dieting might remove surplus fat, the hen should be killed for table.

A common form of tumour is composed of the yolk of eggs which have matured, but which have failed to gain access to the funnel of the oviduct; such tumours are yellow, and made up of concentric layers of yolk-substance combined with membrane, hence another coined term—"egg tumours." Similar tumours are also formed owing to some blockage high up the oviduct resulting in a rupture of that organ; and the ripe yolks find their way into the abdominal cavity, instead of being enveloped in "white" and shell and laid in the ordinary way. Cysts and tumours of the ovary do not lend themselves to treatment.

EGG BINDING: EGG RETENTION. *Symptoms.* Slow gait, abdomen almost touching the ground, tail down, face and comb abnormally flushed.

Cause. A cessation of the albuminous fluid which acts as a lubricant in the oviduct.

Treatment. Promote the secretion of the natural lubricant by using sodium sulphate solution every third day for a fortnight. If, however, an artificial lubricant is essential, inject glycerine directly into the oviduct. Put one fluid ounce of glycerine into a small cup and make it warm in order that the oviduct will not eject the lubricant on account of contraction produced by a cold substance on a warm surface. Fill a syringe with the warm glycerine, insert it into the oviduct and ascertain the position of the egg. When the egg is located, urge the nozzle of the syringe between it and the wall of the oviduct, and discharge the glycerine. Either a glycerine syringe, or what is called a rectal syringe, is ideal for the purpose. Two points must be borne in mind, viz. that the operations are carried on in the oviduct and not in the rectum, and that the bird is very carefully handled to prevent breaking the egg. In the hands of an expert this is the safest and best method of causing the ejection of an overdue egg; but I advise the novice to let a veterinary surgeon or a poultry disease specialist operate.

EGG-EATING. So called "vice," generally contracted by accident.

Cause. The accidental breaking of an egg, generally thin-shelled or soft, resulting from insufficient nests forcing two or more layers to use one at the same time, or insufficient material to cover the wooden floor of a nest, or an egg laid at night on the droppings' board.

Treatment. When the guilty hen is discovered undoubtedly the best "cure" is to kill her for table, because she will not only terrorize other birds which want to lay, but she can teach the rest of the flock the costly habit. However, there are means of treatment, any of which could be tried, viz.—

(*a*) Catch the hen up, and with clippers or scissors remove the sharp point or horny tip of the upper mandible nearly, but not quite, to the quick; it is merely horn, its removal causes no more pain than trimming one's finger nails, and it will grow again; (*b*) fit trap-nest fronts; (*c*) darken the nests by means of hessian split up the centre; (*d*) provide more nests, and keep about 2 in. of litter in each; (*e*) tone the birds to ensure hard shells; and (*f*) remove the culprit to a coop and give her a doped egg, by blowing the contents of a normal egg and filling with a paste consisting of two parts of asafoetida, one part ginger, and a little flour, on the fluid side—get a chemist to prepare the paste, and tell him for what purpose it is required. If all of these suggested treatments fail, eat the bird. Do so without wasting time, if the management is correct.

EGG PASSAGE, PROTRUSION OF. Technically known as Prolapsus of the Oviduct.

Symptoms. Part of the oviduct protruding beyond the vent.

Cause. Frequently observed in old hens which have been prolific layers. Constipation, over-feeding, and straining to expel large eggs are direct causes. Prolapsus may also occur as the result of inflammation of the oviduct, or from any condition which prevents the passage of the eggs.

Treatment. If the protrusion is little more than the mucous membrane of the oviduct and continuous with the skin of the *cloaca*, apply a small quantity of glycerine of borax, and gently push it back, using a small sponge soaked in antiseptic solution; isolate the bird for a few days. If the protrusion is of considerable extent kill the bird for table.

EGGS, FAULTY. There are occasions on which faulty eggs may be laid, faulty in their contents, their shape, or the texture of their shell; but it is difficult to detect the offenders unless the birds are trap-nested and recorded. Such faults as blood clots, double yolks, musty flavour, pale yolks, soft or thin shells, no yolk at all, and long, or round (ball shaped), or flat-sided eggs are almost invariably due to mismanagement and wrong feeding; and a thorough revision of the dietary will generally bring about a normal condition. In the case of sanguineous or thin-shelled eggs, the layer should be given 5 drops of tincture of iron perchloride in a teaspoonful of milk, twice daily; but when peculiarly shaped eggs are produced as a regular habit, the hen should be killed for the table, as it generally indicates an over-fat condition, and the bird is ripe for eating.

FEATHER-EATING. Another so-called "vice," generally supposed to be due to a "vicious habit," numerous theories, among them idleness and thirst, having been mentioned as accounting for it. There are two forms of feather-eating, viz. "self-plucking," and the eating of other fowls' feathers.

Symptoms. Bareness of the shoulders, back, and other parts of apparently healthy birds during other than the moulting period.

Cause. A parasitic mite living upon and irritating the roots of the quills; and most prevalent in spring and summer. The mites can be easily found among the fine down at the roots of the feathers. The fowls pluck out the feathers to allay the irritation.

Treatment. As the disease is contagious, isolation of the affected bird is the first step, especially if it be a cock. The mites readily yield to treatment with oil of cloves rubbed into the infected area. Healthy quarters, earth in which the fowls can wallow and dust, and plenty of fresh green food will keep them free of depluming mites, and thus prevent feather-eating.

GAPES. A chicken disease seen in the young of fowls and turkeys—also pheasants, partridges, and other birds—rarely in adult stock, chickens under four weeks old being most susceptible.

Symptoms. Gaping, i.e. frequent stretching of the neck to the full extent, retching or choking for breath, coughing and sneezing, dullness and inactivity, ruffled feathers, drooping of the wings and loss of appetite. Unless relief is given, weakly chickens die from suffocation, pneumonia or parasitic bronchitis due to the presence of gapeworms in the windpipe and bronchial tubes, while the intestinal contents will probably contain numerous eggs of these worms.

Cause. Small round worms (about half an inch long and of a grey-red colour) in the windpipe; the male, about one-third of this length, is nearly always found attached to the female, like one side of the letter Y, and on this account they are often spoken of as the "forked worm of the fowl."

Treatment. Whenever premonitory symptoms are observed immediate action should be taken. There are many methods of treating the disease actually in the chicken. One of the most effective is to catch up each bird and, by means of a pipette, insert one or two drops of a solution of potassium iodide (10 grains potassium iodide to 1 oz. distilled water) into the windpipe—the opening of which is at the back of the tongue—and after a second or two, hold the bird head down and eject the worms. Another, recommended by some authorities, is to get a wing feather, strip off the barbules to within a short distance of the point so as to leave a few to form a brush, and after dipping it into a mixture (made up of oil of turpentine 2 tablespoonfuls, oil of tar 1 teaspoonful, and linseed oil to make up half a pint), pass it down the windpipe, and give it three or four turns before withdrawing it. Either of these methods—of which I prefer the former—should be repeated if necessary in two or three days. In addition to this, add camphor to the wet mash once daily—one drachm powdered camphor thoroughly mixed in the food for 100 chickens.

It is said that giving the birds no other water to drink than that which is strongly impregnated with camphor will act as a preventive; but my own experience with chickens reared on a patch of land in Buckinghamshire which was said to be gape infested, was that strongly impregnating the mash with onions prevented an attack. All chickens which are being treated must be strictly isolated—for preference in a single-tier battery brooder where they would be under perfect control—while the ground must be sprayed (with a solution containing 1 lb. of sulphate of iron and 10 lb. of salt to 20 gallons of water) to kill the young worms on the herbage; and four tablespoonfuls of this solution may safely be put into every gallon of drinking water. Spraying can be undertaken by

means of a watering can, and it should be done in the morning when the grass is wet or bedewed. The solution suggested will kill the young worms as soon as they have hatched out and before they have time to be taken up by the chickens with their food or water.

In connexion with gapes it may be remarked that strong vigorous chickens do not suffer seriously from the disease, while there is no occasion to kill chickens because they are troubled; treat them at once, and when they are "cured" place them on clean ground, otherwise they are likely to become re-infected from the ground contaminated with their faeces containing the eggs of the gapeworm which they have swallowed. The gapeworm egg does not hatch in the chick but outside the body in wet or moist places. It is difficult to kill gapeworm eggs with disinfectants; but let them hatch out and the embryos are easily destroyed. Dryness is unfavourable for the hatching of gapeworm eggs.

Chickens in coughing up the worms from their windpipe swallow them, and the eggs of the parasites are passed out with the faeces, and, in a few days, hatch in the moist or bedewed grass. Then the young worms or embryos climb on to grass blades or other vegetation and are taken in by the young birds, in which they undergo changes after travelling through the system, gaining the lungs and finally the bronchial tubes, where they become mature, copulate, and produce eggs. Wild birds, such as starlings, blackbirds, thrushes, etc., should be kept from the rearing ground, because they introduce the malady in consequence of their being highly infested with parasites. Nevertheless, there need be no fear of gapes attacking chickens which are reared in battery brooders (on wire floors), or indeed those which are ground-reared, if precautions are taken; and I pin my faith to the use of the onion in the mash of chickens (fowl and turkey) to prevent it.

"Going Light" (Asthenia). Like "Down Behind," this is an expressive term coined by poultry-keepers. It refers to asthenia, a disease characterized by emaciation. Without any apparent cause, or the exhibition of conspicuous symptoms, a bird may fall into a general decline and literally waste away. Many poultry-keepers are familiar with that form of emaciation where, apart from the loss of weight, the affected fowl offers visible signs of excellent health, such as good colour, bright eyes, and general activity —until picked up, when it is noticed that there is an appalling loss of weight. If such a fowl be submitted to a post-mortem examination, the organs usually are of healthy colour and of firm structure, but below the normal size. In short, beyond their atrophied condition, there is no evidence of disease.

Cause. A deficiency of the enzymes or ferments, particularly a deficiency of them in the area of the duodenum. When the secretion is scanty, malnutrition occurs, since unless the foodstuff contained in the alimentary canal is prepared for assimilation, the fowl does not receive the nutriment of the food; and no matter how nutritious the food may be, it is of little use to the bird which is unable to secrete a sufficiency of the all-important enzymes.

Treatment. Adjusting the diet with regard to vitamins, or providing a substance such as malt diastase, which will carry on to a large extent the conversion and digestion of foodstuff. However, it is preferable to kill rather than treat a bird suffering from asthenia, simply because it means special dieting all through its life, and, whether male or female, it is useless for stock purposes. I once kept a young cock alive for nearly a year for experimental purposes; but such a course is out of the question in practical poultry-keeping.

This malady, unlike Avian Tuberculosis, is not contagious, and there is certainly no need to readjust the diet when the remainder of the flock from which the sick bird is removed proves by egg production, fertility, and in other ways that it is suitable. If, however, several members of the flock were to fall into a general decline, then a specimen should be sent to a laboratory for post-mortem examination, because the fowl is subject to emaciation having its origin in causes of wide and different pathological phenomena.

In connexion with fowl tuberculosis I may just add that, as the majority of hens cease laying when they become affected with this malady, there is very little chance of its being transmitted by the egg. According to recent researches the danger from eggs of affected hens transmitting the disease to chickens is almost nil, since post-mortem examinations made on tuberculous hens show that only from 1 to 3 per cent have lesions in the ovary or oviduct. Again, human beings are very resistant to fowl tuberculosis, and should by chance an egg become infected the boiling process to which it would be submitted before it was consumed would destroy its infectivity. On no account should dead tuberculous birds be given to pigs, which are very susceptible to fowl tuberculosis.

Layer's Cramp. Another coined term, and expressive, because beyond temporary loss of leg power, the bird looks healthy about the head, and eats fairly well, while its plumage is in good condition, although it may appear slightly dazed. As a rule it sits about the run and, when disturbed, moves with difficulty. It is frequently encountered among good layers whose diet is deficient in iron, and especially in winter and spring.

Treatment. Isolate the hen in a quiet place, and

confine her diet to short rations of wheat but plenty of fresh green food; and keep grit and clean water handy. Administer at night one compound rhubarb pill, and, in the morning, 5 drops of tincture of iron perchloride in a teaspoonful of milk; continue this treatment for about a week. If necessary adjust the diet of the flock.

ROUP AND THROAT AILMENTS. Roup has been known among poultry-keepers for hundreds of years; but rather than being a disease, it is a loose term applied to several ailments of the head and throat of fowls, from a simple cold to diphtheritis. Possibly most of the troubles included under roup start with a cold in the head or catarrh; but since there is so-called "Dry Roup" as well as "Wet Roup" it can be imagined that the symptoms are of a wide variety and a contradictory nature. A simple cold manifests itself in fowls, as in humans, in different ways. Nevertheless, I maintain that fowls which are of strong stocks, kept under hygienic conditions, and properly fed, will not contract roup, since even if a bird does "catch a cold" it can be checked by prompt action and suitable treatment.

In considering one form of roup—and probably the most common, viz. Avian Diphtheritis—it is advisable to do so in three stages. Diphtheritis is a contagious disease which affects the mucous membrane of the nasal passages, the eyes, the mouth, and the windpipe, and it is said to be caused by a micro-organism, the bacillus *diphtheriæ gallinæ*. It has been suggested by at least one authority that the disease (diphtheritis) is more apt to occur among prolific layers—at the height of their productive period—than other stocks; but such is not the general experience, although I admit that any bird whose vitality is low by neglect or mismanagement is in a condition to contract almost any ailment. It is a disease generally confined to the winter months, when fowls are apt to be artificially treated under the mistaken idea that they should be kept unduly warm, while it is met with in damp and low-lying districts, rather than on the hills, and among birds which are forced to breathe impure air by being confined to insanitary night quarters.

The First Stage. The affected fowl presents the symptoms of catarrh or common cold, which has been dealt with under that name. In this stage there may be puffiness or swelling of one side of the face, to such an extent as to cause the eye to be almost hidden. This condition is loosely referred to as "One-eye Roup" or "Swelled Head," and the application of white carbolic ointment gives relief.

The Second Stage. This is characterized by the exhibition of symptoms of which the most prominent is a glutinous discharge from the mouth and nostrils, a grey-yellow exudation, so-called "cheesy" matter, and foul smelling. The treatment for this stage is the same as that for catarrh, with the addition of local treatment. This consists of disinfecting the cavity of the mouth and throat with a pledget of cotton wool saturated in a 10 per cent solution of hydrogen peroxide. The mouth should be treated twice daily, using a fresh pledget of wool each time, and afterwards the wool must be burnt and not left about the pens.

The Third Stage. The typical diphtheritic growths will be found attached to the membrane of the mouth and throat. The growths must be removed without damaging the surrounding tissues; and for the purpose a fine hairpin is a useful instrument. First paint the growth and surrounding area with 10 per cent solution of hydrogen peroxide; then engage the substance with the loop of the hairpin and draw it towards you. After removal, paint the lacerated surface with hydrogen peroxide as recommended above. The internal treatment for all stages is the same, it being necessary to adopt local treatment in the second and third stages.

It is essential to isolate affected birds in all stages of the disease; and when handling them to wear rubber gloves, or to wash one's hands in hot soapy water containing a good disinfectant. The disease is highly contagious; hence if fowls are being treated in their house or run, means should be at hand for the attendant to disinfect his boots before passing off the ground. Personally I should not hesitate to cut my loss if diphtheritis were unnoticed among the layers until the third stage, by killing and burning the fowls, and disinfecting the house and land.

SCALY LEG. Again a "poultryological" term, referring to scabies of the leg, but again expressive.

Symptoms. The scales of the legs and feet raised and separated, with a chalk-like excretion accumulating between and over them; rough lumpy crusts are formed, and under them and the scales the cause of the disease lives and breeds.

Cause. A parasitic itch mite. Insanitary conditions, as well as those which are likely to result in a deficiency of oily products, are likely to be predisposing causes. I am much inclined to believe, from experience, that it is connected with scabies, a contagious skin disease, resulting from similar causes, and that it is somewhat common among fowls which are kept on sandy land, while ashes will aggravate it.

Treatment. The disease is contagious; and although it does not appear to affect robust cockerels and pullets which may come into contact with adult stock so diseased, it is most inadvisable to use for brooding purposes a hen which has the least sign of scabies of the leg, because the chickens will suffer from it. Isolation of diseased birds is essential. At the commencement of the treatment the shanks and feet

should be carefully washed with soft soap and hot water, using a soft bristle brush, so that the crevices in the crust scales can be reached. Then apply daily a mixture of equal parts of flowers of sulphur and vaseline, making it quite warm and brushing it well in. Unless the case is a very advanced one, however, this mixture can be applied without the preliminary washing; or the scales should be painted every third day with tincture of iodine. The crust scales should be allowed to drop off, and on no account be pulled off.

VERTIGO (DIZZINESS). *Symptoms.* Giddiness which causes the bird to throw its head backwards or to bend its neck to one side; sometimes there are spasmodic movements of the wings; the gait is uncertain, such as the bird walking backwards, or from side to side, or in a circle. In some cases the affected bird falls to the ground, apparently unable to move. In other cases there are convulsive movements of the legs together with occasional flapping of the wings. Before an attack comes on there is occasionally a warning. There may be dullness, heaviness, or a stupid look about the bird for a day or so beforehand.

Cause. A congested state of the brain, which in turn may result from an obstruction of the capillaries supplying that important region. Congestion of the brain may occur in sluggish and fat birds, while another prime cause of this malady is intestinal worms. A blow or fall on the head may often induce vertigo; frights, shocks, and irritation of the crop, stomach or bowels will lead to it.

Treatment. If the disease is not of parasitic origin (worms) the treatment lies in materially reducing the blood pressure of the area of the brain. The use of saline aperients is indicated, and the affected bird should be given half a teaspoonful of sodium sulphate (Glauber's salt) dissolved in a little water. After the aperient has acted, 5 grains of potassium bromide should be dissolved in water and administered to the patient.

WORMS (ROUND). Worms are commonly termed internal parasites. It is said that no bird is free from some species or other, though some species are more injurious than others, the worst being the very small ones, and that all poultry should be dosed for worms at least twice a year—in spring and autumn. Most poultrymen, however, do not treat the flock, but only birds which they observe passing the worms.

Symptoms. In the early stages the excrement will often be found streaked with blood; as the worms multiply, the birds become ravenously hungry, there is increased thirst, the plumage is ruffled, emaciation is pronounced, and there may be vertigo.

Cause. Eggs of the parasites may be in the drinking water or in road drift; they may be picked up from tainted runs, or by the birds eating earth worms.

Treatment. All suspected victims should be isolated in coops with wire-netting floors, having trays 3 in. below sprinkled with freshly slaked lime, so that no evacuations will reach the ground. To each sufferer should be administered, once daily, 2 drops of oil of turpentine thoroughly mixed in 1 teaspoonful of glycerine, given early in the morning when the crop and intestines are empty. On the previous night administer Epsom salts in water—at the rate of one tablespoonful of salts in one pint of water—and give it to the birds when they are thirsty. Burn all droppings. Afterwards give, in the drinking water, sulphate of iron, ten grains to the gallon. If many fowls suffer, their quarters should be vacated, cleaned, and disinfected.

WOUNDS AND FRACTURES. Wounds such as those caused by birds fighting, catching their comb on a jagged edge of wire-netting or an unobserved nail, or laceration of hens by male birds are the most common with which the poultry-keeper will have to deal; and in such cases cleansing to remove any blood and painting with tincture of iodine will generally suffice, and, if necessary, stitching, as advised in "Crop Binding." In the case of laceration, the tips of the male bird's claws should be removed and rounded with a small rasp, while if his spurs are long they, too, should be shortened, or entirely removed by a veterinary surgeon or a poultry specialist—a novice should not attempt it. Leg and wing fractures are also best left to specialists, although unless the unfortunate creatures are valuable it is generally more advisable to fracture the neck also. However, a poultry-keeper with a knowledge of ambulance work should be able to set broken bones.

There are other diseases than those mentioned above which have been known among fowls, young and old, and especially among chickens which are reared on stale ground; but whenever sickness occurs, prompt action and strict isolation must be observed, and when in doubt as to the trouble, consult a poultry specialist. I generally find that when bullying breaks out among fowls which have formerly lived amicably together there is need for a close inspection. Nature is still strong in the domesticated hen; and a healthy bird seems to resent the presence of one which is sick. Those which mope, or do not come quickly to the food when grain is thrown down, should be caught up, and overhauled, and, if necessary, put where they can be under closer observation.

Waterfowl

Stock ducks and geese seldom give much trouble; and provided they have dry sleeping quarters and are fed on common-sense lines, little beyond an occasional case of egg binding or prolapsus of the oviduct

seems to worry them. These birds can remain out of doors all day long in a rain storm—in fact, they seem to enjoy it—but they cannot stand damp quarters at night. So they should always be well bedded down when they are shut in. Egg binding is certainly not a frequent ailment, and when it—or prolapsus of the oviduct—does occur, it is generally on account of the birds being too fat, or the diet overstimulating and resulting in double-yolked eggs. In either of these cases I should not attempt treatment, but would kill the bird for table and revise the diet. Occasionally, perhaps, a duck or a goose will "go light"; but it is more likely to be a case of asthenia than tuberculosis. Lameness, due to injury to the ball of the foot, may occur; but the only case I came across yielded to the treatment mentioned under "Corns (Bumblefoot)."

Ducklings and goslings are subject to heat apoplexy or "staggers," due to lack of shade and too much exposure to strong sun, housing in close quarters, overcrowding, and the excessive use of highly concentrated foodstuffs—too large a proportion of grain and meat and not enough vegetable and shell. Some people who attempt to keep young waterfowl in unnatural surroundings fail to imitate Nature in the manner of feeding; the food of these birds, when ranging their favourite haunts, consists of light meats —frogs, fish, worms, and insects—soft grain, and gritty material including shell. In cases of giddiness or "staggers" (heat apoplexy) the young birds almost invariably fall on their backs and are unable to get up; a dry and shaded run, in a quiet place, generally pulls them round.

Weakness of the loins, another ailment of ducklings and goslings, is often due to overcrowding and failure to provide them with a suitable door to their sleeping quarters. Chasing them about and making them unduly nervous will also cause it—they should never be driven or allowed to run. Chilling, even to the extent of inflammation of the lungs, has been known among waterfowl in their very early days, up to about a fortnight or so old, owing to allowing them to get soaking wet, or keeping them in a close, damp, and stuffy coop at night; the sudden change to the chilly air on their being liberated next morning is too much for them. Nevertheless, all these ailments can be very easily avoided by common-sense management, such as is outlined in preceding chapters.

Turkeys

Mismanaged turkeys are as subject to disease as are mismanaged fowls; and, of course, the reverse applies. Only too frequently these birds are in-bred by those who do not understand them, possibly because, when the breeding stag in use gets too old to fertilize the eggs, the cost of another to take his place is considered too expensive, and the males are exchanged in the neighbourhood rather than "entirely fresh blood" introduced. However, as specialist breeders of turkeys are well aware—and, therefore, they do not practise it—in-breeding is most disastrous and produces delicate birds, which are apt to contract almost any disease. Probably the most important things the breeder has to guard against are internal and external parasites, or, to put it plainly, worms, gapes, and lice, any of which can play havoc among young turkeys.

It is considered by some authorities that turkeys are very much more susceptible to worms in their various and many forms than the common fowl; and for this reason a well-known and successful breeder, Mrs. Elce (Honorary Secretary of the Bronze Turkey Club), suggests that all breeding stock should be de-wormed in the spring, just before the birds begin to lay, and then every three months, and that if the chicks are not reared intensively, they should be so treated at four to five weeks old and then every three months, the same as the breeding stock. In connexion with this subject Mrs. Elce states that, since adopting this treatment, she has had the easiest possible rearing seasons, the birds—reared in the natural way, by broody hens and in coops—being extremely healthy and losses being very few. I must admit that, so far, I have not found de-worming necessary, possibly because my turkeys have a wide range, and all soft food given to them, young and old, is flavoured with onions of some sort, while such food is always put into troughs. However, the suggestion of such a successful breeder of turkeys, and the results obtained by periodic de-worming, are well worth noting by those who keep turkeys.

ENTERO-HEPATITIS ("BLACKHEAD"). One of the most contagious diseases known among turkeys is entero-hepatitis or "blackhead," although the latter word is somewhat misleading, because it is seldom that a turkey so affected presents symptoms of anything approaching a black head.

Symptoms. The birds are mopish, and they appear to have no desire to partake of food; the eyes are closed and deeply sunken in the head. Sometimes a dark hue is imparted to the head, this being responsible for the popular term "blackhead." The evacuations are of a gummy consistency, small in quantity at first, and gradually increasing until death occurs. They are mustard yellow in colour, and usually intermingled with white streaks. The disease generally is confined to the cæcum and the liver. When the disease in the cæcum is slight it is doubtful if the affected birds have profuse diarrhoea, which is more or less present in other cases. In many of the birds

the droppings will be liquid, and stained a deep mustard or sulphur yellow; this being one of the chief characteristics of the affection. Sometimes there are blackened clots in the droppings; these blackened clots suggest haemorrhages. There is, however, no surer means of diagnosis than a microscopical examination of the evacuations. This calls for expert knowledge of the subject, and, as the average breeder of feathered stock has little time for the study of microscopy, it is essential that the examination be left in proficient hands. If a small quantity of the suspected excrement were packed in a clean glass container and forwarded to a laboratory specializing in poultry diseases, the sample would be microscopically examined and a report furnished for a small fee.

Treatment. The highly contagious character of the disease calls for rapid and stringent measures. It is far better to prevent the disease spreading to the bulk of the flock than to devote one's whole attention attempting to cure a few affected birds. In the spore stage the causative micro-organisms retain their power of development for a considerable period. The disease is spread by the introduction of the spores into the digestive system, where the life-cycle of the parasite is completed with disastrous results to the host.

No set lines can be laid down for treating the disease, but similar precautions are necessary as in other contagious diseases. The birds should be removed to fresh land and the vacated quarters thoroughly treated with disinfectants—the land with lime. The evacuations require the same treatment, as quantities of spores are ejected from the diseased areas of the intestine. When treating birds affected with this disease it is advisable to add to each pint of drinking water one teaspoonful of sodium hyposulphite. This salt exerts a wonderful influence upon the diseased area. In the soft food a little sublimed sulphur may be added, one dessertspoonful being sufficient for twenty birds of medium size.

To conclude this chapter on disease, let me repeat what I said at the beginning. Poultry can be kept perfectly healthy if they are properly managed. My object in writing this book is to assist the reader to manage poultry in such a way that they shall be healthy, and thus be a source of pleasure and profit, as they always have been and are to me.

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