CHICKEN MONEY

HOW TO MAKE FARM FLOCKS PROFITABLE

BY
HOMER W. JACKSON

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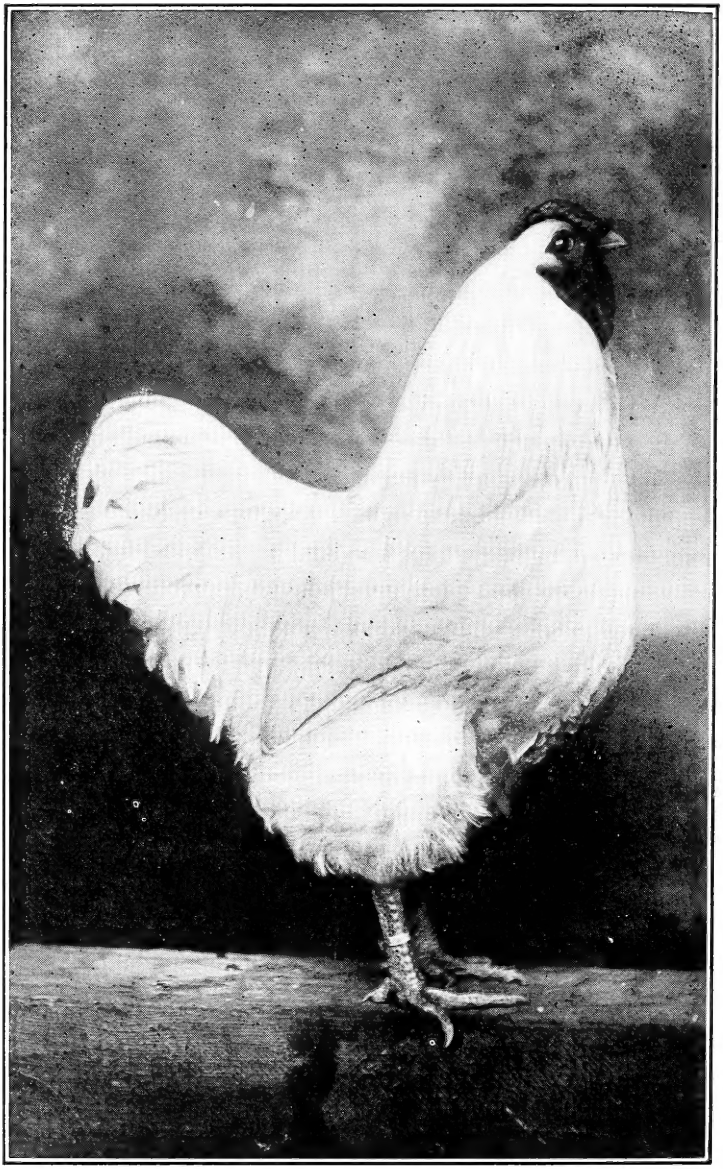

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BY

HOMER W. JACKSON

Poultry Editor of

The National Stockman and Farmer

The Author.

Prof. Homer W. Jackson, author of this work, is a commercial poultryman as well as a scientist. His first venture in the business was with a small flock of common fowls when he took charge of a sixty-acre Ohio farm. The hens proved to be the most reliable source of income on this farm, so he built up his flock to about 600. As he had no previous training in the poultry business and was constantly looking for information he was much impressed by the lack of definite knowledge then available about the farmer's hens. There was plenty of poultry literature, but few experiments had been made to determine facts essential to the success of farm flocks. Wanting to know the facts Mr. Jackson became an experimenter, and his work attracted the attention of The National Stockman and Farmer. In 1902 an arrangement was made whereby Mr. Jackson could devote his time and his flock to experimental work and the Stockman Poultry Experiment Farm was established, to run for almost seven years. When this work was undertaken few experiment stations had paid any serious attention to the subject. More experiments were made during these years that on any other farm or at any experiment station in the country, and the results obtained were quite similar to those reported since by experiment stations. During this period and later Mr. Jackson visited many if not most of the profitable poultry farms in the country from Massachusetts to the Middle West. His work attracted the attention of Dean Thomas F. Hunt of the Pennsylvania State College, and in 1909 he accepted the position of Instructor in Poultry Husbandry at that institution. While there he made many tests, some of which have been published as bulletins. A large incubator manufacturer then made Mr. Jackson an offer which the College could not match and he became editor of its bulletins and literature. His long experience in raising, preparing and selling poultry and its products, his enthusiasm as an investigator, and his wide opportunities for observation have qualified him to write a book for farm poultry-keepers. And that is what this book is. It is not intended for fanciers or breeders of show stock but for farmers. To them we feel that it will be useful, particularly in leading them to put their poultry on a business basis and helping them to make money out of it.

CHAPTER I.

POULTRY AS A FARM CROP.

There may be two sides to the argument about the poultry business as an exclusive specialty, but there is not the slightest room to question its profitableness as a branch of farm work. The poultry specialist can never compete with the farmer in the relative cost of production, and where the resources of the farm are carefully estimated and utilized, the production of farm poultry is invariably a profitable source of income. In a recent investigation undertaken by the Ohio State Experiment Station, in which the profit from farm flocks was carefully estimated in a number of cases in different parts of the state and under widely varying conditions, it was found that the average gross income from each fowl kept on the farm was approximately $1.76 and the net profit after deducting cost of food, labor and interest on investment was 87 cents per hen; and this in spite of the fact that our farm flocks are rarely so managed as to get the maximum returns from them.

The poultry industry has a number of advantages as a farm crop which are well worth considering. If there is any advantage in sending finished products to the market instead of unfinished products, then poultry must be given special recognition because such products represent the highest class of finished products that come from our farms. No other farm product represents an equal value in proportion to its weight. No other branch of the livestock industry produces a larger income in proportion to the value of the stock or the cost of equipment or feedstuffs used. The annual value of the poultry products of the farms of the country is estimated by government statisticians at 400 per cent on the market value of the stock. The amount of feed required to produce a given weight of eggs or market poultry is little if any greater than that required to produce a corresponding gain in other kinds of livestock or livestock production, while the market value of the product is very much higher. In other words the farmer who feeds his grains to hens may secure a larger total income from the grains supplied than can be secured by utilizing any other class of livestock. In addition to this there is a great deal of waste feeding material present on the average farm which may be utilized by fowls, taking the place of market grains—feedstuffs that could not be utilized in any other way. For this reason the farm which carries a good flock of poultry should have the smallest possible waste in the utilization of farm products and resources. It is worth considering also that on the farm it is not necessary to devote any

appreciable amount of land exclusively to poultry. Under ordinary conditions the poultry crop represents a double profit from the land, interfering in no way with the utilization of the land for other purposes, with right management. The poultry products sold from the farm represent practically no loss of fertility and are marketed at slight expense. Not only this but the presence of the poultry flock may be made decidedly beneficial to the land. The fowls assist in keeping down weeds, contribute fertility of great value, and with proper care and attention will cause no damage to the farm crops. To the farmer of small means the poultry crop is of special value, as the necessary investment in buildings and equipment is quite small in comparison with the revenue which may be derived, and the possession of a certain income from the poultry flock has sustained many a farmer and kept him afloat during the years when he was getting established in other lines of farming. The story of one Ohio farmer is an excellent illustration of this point.

How a Farm Flock Built a House.

Twenty years ago this farmer started in life for himself with a 100-acre farm, a debt, and some chickens. From the start he appreciated the possibilities of poultry and within two or three years had increased his flock to 200 hens and has kept that number on an average every year since. He tried other lines of farming and has been successful, but still considers poultry the most profitable department. During all these years his gross income from the poultry flock has been from $300 to $500 a year—never less than $400 in recent years—and this certain income has pulled him out of many financial holes. Other crops and products have varied in gross income or in profit with the season or the markets, but the poultry income has never disappointed. Ten years ago he went in debt for an addition to his farm and shortly after his house burned down. Under his conditions it would have been practically impossible for him to meet this burden without the help of the hens. With that annual poultry income of $400 or $500 back of him he was able to go right ahead. The house shown in Fig. 1 was built and furnished entirely with hen money. There is not a better farm house in the township, and all debts have been paid off. This has been done with no special strain and in spite of a big handicap in marketing. The farm is located ten miles from market and on a bad road so that the farmer is not able to market his eggs to advantage, selling entirely in the local market.

The story of his success is, in varying degree, duplicated in thousands of farm homes. And with such illustrations all around us it is unaccountable that we are so slow to awaken to the possibilities of the larger development of farm flocks.

CHAPTER II.

THE IMPORTANCE OF LARGER FARM FLOCKS.

According to the figures given in the last census the average farm flock numbers 53 fowls, and while there is no question but that these flocks are paying there is equally no room to doubt that our farmers are realizing only a small part of the income that is possible, because of the fact that a flock of 53 fowls is too small be economically managed. As to a producer of income it is an absurdity. In no other industry is there so wide a margin between the prices received for fancy products and those of ordinary market grade, and as in all other lines of production the largest profits are always in the better grades. The production of fancy poultry products is easily within the reach of every producer, because in the last analysis it is simply a matter of getting the product to market while strictly fresh.

Practically all eggs are fancy eggs when they are first laid. It requires no special skill, ability or knowledge to produce eggs of highest grade, nor is there any difficulty in getting fancy prices for them on the market, while they are in this class. To do this, however, requires prompt marketing, which is out of the question where small flocks only are kept. Hence the daily production of the average farm flock is too small to be marketed economically except at relatively long intervals. Farm eggs are of notoriously poor quality, not because they were not as good originally as the best that ever go to market, but because they have been held so long and have so deteriorated with age that their value in the market is only a fraction of their original value.

Why Farm Eggs are Cheap.

In the summer of 1911, when the best eggs were bringing 25 cents a dozen in the Pittsburgh and Philadelphia wholesale markets, eggs were selling in central Missouri at two and three cents a dozen, and considering their condition that was about all they were worth; and yet these eggs were originally as good as the 25-cent eggs in the city and could have been marketed in prime condition at a cost of a few cents, if the individual grower had had eggs enough to make it an object for him to put them on the market while they were still fresh. Not all of this difference, it is true, can be charged directly to the small size of farm flocks. Something should, at least, be charged to carelessness and indifference. But the fact remains that Missouri farmers were not producing enough eggs to induce them to make

proper efforts to get them into market in prime condition. As a result they had to dispose of the eggs through the ordinary channel of huckster and country store-keeper, with delays all along the line, and the result was a thoroughly disgraceful condition.

Again, in December, 1911, eggs were bringing 45 and 50 cents a dozen in the Pittsburgh market, while within 100 miles of Pittsburgh eggs were selling from the farm at 20 cents a dozen. In this case it was not a matter of quality, it was simply a matter of marketing. The farmers were producing so few eggs that it was not worth their while to give any attention to marketing, and they sold them for what they could get at their doors. It is safe to say that the average farmer can increase the market price of his eggs 25 per cent and possibly more by giving a little attention to the marketing. But in order to do that he must have eggs enough to sell to make it worth his while to meet the requirements of the markets. He must get into these markets while his products are fresh enough to meet their conditions.

The farmer who will increase the size of his flock so that he is in a position to meet the demand of discriminating consumers and who will give some thought to the proper marketing of his product will be able to secure high prices for all the eggs he can produce.

What has been said regarding farm eggs applies with equal force to market poultry. The possibilities in the way of developing a high-priced market for table poultry are scarcely dreamed of as yet. While we persist in marketing the tough, greasy old hens and stringy, staggy cockerels which represent the bulk of the poultry found in our markets today we may expect the consumer to continue buying only in the most limited way. The consumers of poultry, however, are not eating half the number of fowls that they would if the quality of those offered in the market were what consumers have a right to expect. Here again larger flocks are indicated. The owner of the average farm flock has not enough fowls to sell to make this subject of any interest to him.

Another important argument in favor of larger farm flocks is the fact that it is not possible to manage a small flock as efficiently or as economically as a large one. It takes practically as much time to care for the average flock of 53 fowls as it does to care for 200, and one of the most important steps that can be taken, and the step that must be taken before farm poultry keeping is on a really practical basis, is to increase very decidedly the size of the farm flock. The average farm flock ought to be 200 instead of 53 and there is no good reason why this average should not be quickly attained. The writers on poultry topics who are constantly advising people to go slow in going into the poultry business ought to make an exception in the case of the farmers who have comparatively little to risk by a decided increase in the size of their flocks but who have much to gain, and for whom an increase in the flock is the only

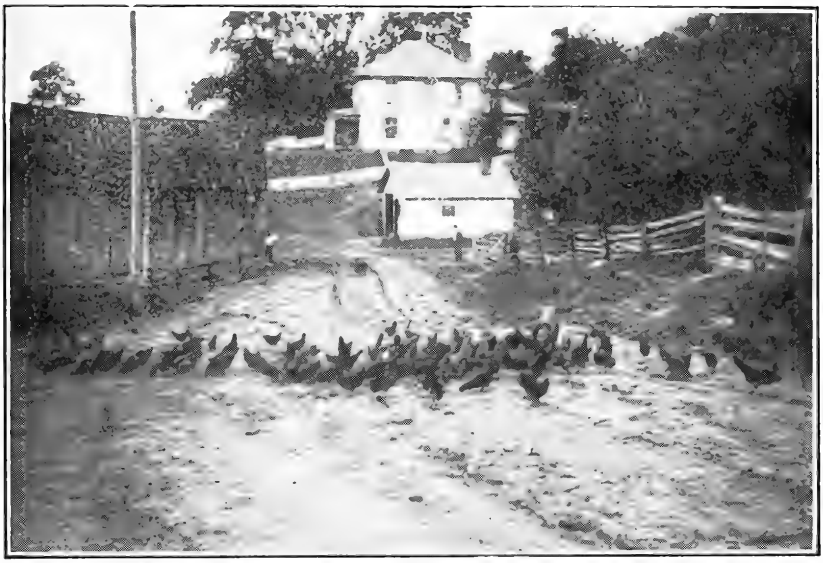


Figure 1—A Home Paid for by Hens

Figure 2—The Wrong Kind of a Hen House

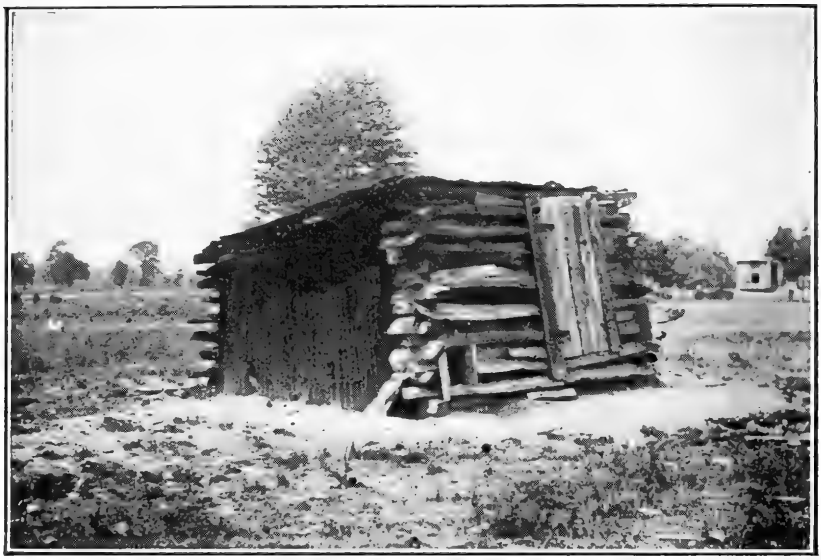


Figure 3—Better than no House

Figure 5—Open Front House, Without Curtain or Glass

practical thing. The man who has had no experience in the poultry business or in any other line of agriculture does need to be cautioned against going into the business too rapidly, but the reasons for this are not reasons which in any way touch the farmer.

I want to discuss this subject, therefore, on the basis of a 200-hen flock. Every farmer who keeps chickens for eggs or for the production of market poultry must have that number in order to manage his business with any real efficiency. With 200 hens his egg production during the most of the year will be large enough to enable him to ship in regular market cases at intervals of a few days, which will make it possible for him to get in touch with consumers who call for the highest quality of eggs and will open up to him a market that will always be a closed door to those with small flocks. He will also have enough surplus stock to dispose of as table poultry to make it worth while to specially fatten it and put it on the market in prime condition.

Extensive Methods for Farms.

Of the two systems of poultry keeping, known as extensive and intensive, without any question the extensive system, which means giving the fowls open range, is much better adapted to farm conditions. While it is always desirable to have a small yard attached to the poultry house, to which fowls may be confined for short periods when special conditions make it desirable, during much the greater part of the year the fowls should have free range over the farm. It is only by doing this that the farmer is able to utilize fully his resources, reducing the cost of production and escaping a host of difficulties that accompany more intensive methods. The farmer who yards his fowls throws away practically all his special advantages and puts himself in direct competition with the specialist, the last thing that he can afford to do.

The danger of injury to field crops, which is usually mentioned in connection with the discussion of open range for fowls, is not a serious one if the fowls are properly fed. Most cases of crop damage attributed to fowls are due to the fact that they are insufficiently fed. Fowls that have enough to eat will do little damage to growing crops except possibly at seeding and harvest time, when they may be confined to small yards for a short period without injury.

CHAPTER III.

BREEDS.

The question of the breed that should be kept on the 200-hen plant is one that cannot be definitely answered because it depends to some extent upon the precise line of production which the individual may have in mind, and more upon his personal preference. The only practical answer that can be given to the question which is continually asked as to what breed is best for the farmer is, "The one you like best." Contrary to general belief there is no special difference in the productive capacity of the common and more popular breeds. In the egg contests which have been carried on in this country and in Australia the best records have been secured by flocks representative of so many breeds that it ought to be clear by this time that egg production is almost wholly a matter of strain and of adaptation of methods to the peculiarities of the different breeds. Given proper care and attention Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons and Leghorns will all approximate the same general level of production. But while this is true it is also true that some breeds are more easily managed than others and are better adapted to ordinary conditions of care and feeding.

The first real interest manifested in the poultry business in this country dates back to 1840 and 1850, when extensive importations of fowls of the Asiatic class were made. These fowls were the progenitors of our present Cochin, Light Brahma and Langshan breeds, and attracted a great deal of interest and awakened a great deal of enthusiasm. It was found, however, that their great size, profuse feathering and sluggish disposition did not at all fit them for the conditions of ordinary farm or commercial poultry keeping and other breeds were subsequently originated, now known as general-purpose breeds, which were expected to accomplish what it was found the Asiatics could not. They were to be good table fowls and producers of large numbers of market eggs, and in a measure they realized this expectation. The characteristics of these general-purpose breeds are essentially similar. They make good table fowls, with proper handling they produce large numbers of eggs, and are by far the most popular with the average poultryman. I believe, however, that one cause which has operated to retard the development of the poultry industry of the country, and to keep the farm flock down to the low average of 52 fowls, has been the overwhelming popularity of general-purpose breeds. It has carried with it, either necessarily or by preference, the hatching and brooding of chickens by natural means, small

flocks, and laborious methods of feeding and management. I question whether it will be possible to greatly increase the average, or in other words to reach the ideal of 200 hens for the farm flock, until the so-called egg-laying breeds are adopted generally in place of the larger breeds which are now the favorites.

Without going into a general discussion of breeds, which is entirely outside the province of this work, I should like to describe the general characteristics of the breeds which are most in popular favor. For the farm flock the Asiatics, or the Light Brahmas, Cochins and Langhans, are for one reason or another, out of the question. These breeds have many points of merit which commend them to fanciers and to producers of market poultry, but the difficulty of managing them successfully in large flocks is such as to make them impracticable on the average farm. The Plymouth Rocks have held their popularity through half a century, and there must be some good reason for this. They are large, fairly easily bred if high quality is not sought, and with proper handling they are excellent layers. Of all our dual-purpose breeds, however, the Plymouth Rock is the slowest in maturing, requiring from seven to eight months to reach full development and profitable production, which makes winter-laying pullets practically out of the question. To secure such it is necessary to resort to early hatching, which is only possible by the use of incubators and brooders, and few farmers with small flocks are provided with these. The Barred Plymouth Rock is characterized by unusual weight or development in the rear, a characteristic which results in an unusual tendency toward the accumulation of internal fat, and which has a great deal to do with the difficulty of keeping fowls of this breed in good condition. Largely because of this fact, which was observed early in the history of the breed, the Wyandottes were originated and as compared with Plymouth Rocks are blockier in form, reach maturity at least a couple of weeks sooner, are less disposed to accumulate internal fat and for that reason are more easily cared for and likely to give better results when fed on the grains usually produced on the farm.

Sixty years ago in what is known as the Little Compton District of Rhode Island the farmers of that section began to develop a general-purpose breed according to their own ideas, and the result of the consistent development of certain characteristics is represented in what we now know as the Rhode Island Reds. This breed reaches the same size as the Wyandotte, is longer in body, contains some Leghorn blood, reaches maturity at least two weeks earlier than the Wyandotte and is fully as productive. In a general way this breed is excellently adapted to farm conditions, but is subject to the objection that the type and color of the breed are far from being well established and without careful breeding it is likely to deteriorate rapidly on the farm. The fowls of this

breed do not make as good table fowls nor do they make as attractive an appearance as do the other general-purpose breeds just mentioned.

In recent years the Orpingtons have sprung rapidly into prominence and popularity. They are good producers of eggs and where white legs and white skin are not objectionable make excellent table fowls. So long as the general market prefers yellow-skinned fowls, however, the farmer can well afford to go slow in adopting a breed possessing the superficial characteristics of the Orpington.

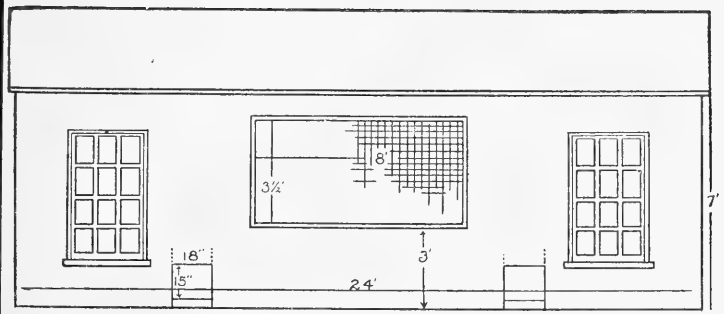
The Leghorns belong to the general class known as the egg-laying type, not necessarily because they lay more eggs than the other breeds but because they have little value for any other purpose and because they produce eggs at lower feed cost, and can be kept in larger flocks and managed with less labor and with less skill than any of the other breeds. East of the Hudson River the general-purpose breeds are more common, apparently because the Boston market demands brown-shelled eggs. West of the Hudson River practically all large successful poultry farms are stocked with Leghorns. The Leghorn is preeminently the commercial egg-grower's breed. Leghorns may be kept in flocks of several hundred, may be fed from hoppers and in various ways the labor of caring for them may be simplified as compared with the larger breeds, and without question eggs may be produced more cheaply. Whether the farm flock should be composed of Leghorns or of some of our general-purpose breeds will depend to some extent upon the personal preference of the farmer, and also upon whether he expects to make the production of market poultry an important part of his business. There is no question about the fact that there are in most localities splendid opportunities for the development of markets for high-class table poultry, which may easily be made as profitable as egg production, and in that case the general-purpose breeds will of course be much more satisfactory. But if egg production is to be the chief source of income, and if no special attention is to be given to developing the trade in market poultry, it is hard to understand why any breed but Leghorns should be preferred for the purpose. The feed cost of egg production will run 25 per cent greater with the larger breeds, and the labor cost will be much greater as well.

CHAPTER IV.

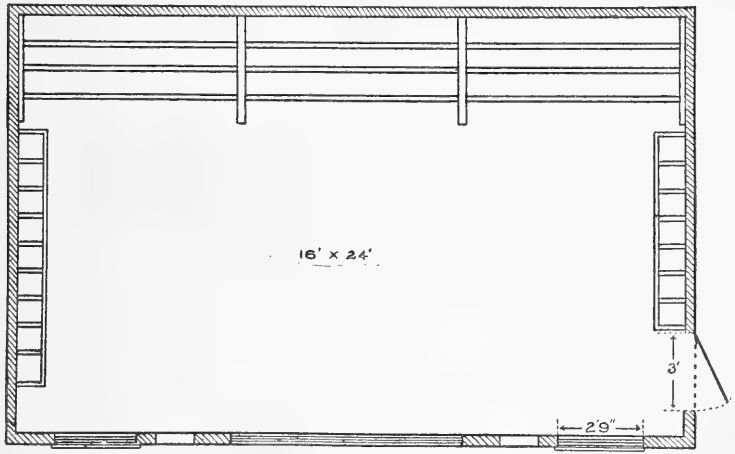
THE POULTRY HOUSE.

With our ideal of a 200-hen flock in mind two poultry houses should be provided, with a capacity of 100 each. It will seldom be found practicable to renew the entire laying flock each year, the usual plan being to select from the hens on hand enough of the best individuals one or two years old to make up about one-half the flock, the remainder being replaced with early-hatched pullets. While there is probably no objection to keeping 200 Leghorn hens in one flock (some commercial plants have as high as 1,000 or 1,500 in a single flock), it is not desirable that pullets and hens should be kept together, as they require somewhat different treatment, and separate houses should be provided. A house suitable for 100 to 125 hens should have about 400 square feet of floor space.

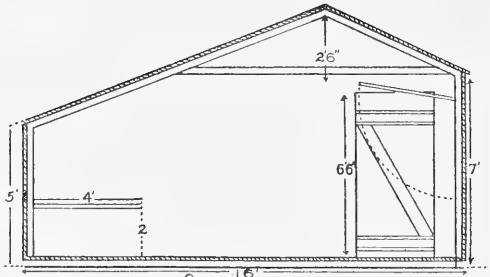
No hard or fast rules can be laid down for poultry house construction. Much depends upon the location, the breed kept, the size of the flock, the amount of liberty the fowls will have and the personal preferences of the owner. There are, however, some general considerations which should be carefully weighed because, in a way, they represent the summing up of the practical experience of our most successful poultrymen. The plans shown in Fig. 4 provide very satisfactory conditions for a farm poultry house. This house is designed to provide winter accommodations for a flock of 100 hens of general purpose breeds or 125 of Leghorns if desired. This number may be further increased in summer if necessary, when the fowls are out on range. It is 16 x 24 feet, 7 feet high in front and 5 in the rear, with a roof of uneven span and with doors and windows arranged as indicated in the diagram. The plan of this house may be modified to meet various conditions, but changes should be made with care. The poultryman has found that, in a general way, the height of the house front should be about one-half the depth, to admit sunlight to the rear of the room. The glass should be proportioned to the floor space, providing about one square foot of glass to 15 square feet of floor space. It will be noticed further that this design provides for a muslin shutter three and one-half feet by eight, a feature which is indispensable in the proper lighting and ventilation of the modern poultry house. It seems necessary to advise against going to extremes in the matter of the open front, a marked tendency at present, and from which it would seem there is bound to be a reaction. Hen comfort is a different matter from human comfort, and fowls will be entirely comfortable at relatively low tempera-



-FRONT. ELEVATION.



PLAN



-SECTION-

Lumber and Materials Needed for a House for 100 Hens.

Sills—	4 pieces 2 x 8 12 feet long.	
	2 pieces 2 x 8 16 feet long.	
Frame—	4 pieces 2 x 4 12 feet long.	
	13 pieces 2 x 4 12 feet long.	
	12 pieces 2 x 4 10 feet long.	
Rafters—	20 pieces 2 x 4 12 feet long.	
Perches—	4 pieces 2 x 4 12 feet long.	
	Total, 550 sq. ft. @ $2.50	$12.75
Weatherboarding 700 sq. ft. No. 1 siding @ $3.50		24.50
Rafter braces, 12 boards 1-in. x 6-in., 10 feet long		1.25
Sheathing for roof, drop platform, nests, etc., 700 sq. ft. @ $2.50		17.50
Roofing, five squares, @ $2.25		11.25
Windows, four sash, six-light, 10-in. x 12-in., @ $1		4.00
Stripping, 500 lineal feet 1-in. x 3-in. surface pine		5.00
Hardware		5.00
Paint		5.00
Total		$86.25

Materials for Board Floor.

Joist—11 pieces 2 x 8, 16 feet long	$ 5.87
Flooring—475 sq. ft. No. 1 pine flooring at $3.50	16.62
Total	$22.49

Materials for Concrete Foundation and Floor.

Walls—24 x 24 x 16 x 16, six in. thick, 3 ft. deep, 120 cu. ft. @ 12c..	$14.40
Floor—284 sq. ft., two inches thick, 48 cu. ft.	5.76
Total	$20.16

Figure 4—House for 100 Hens

tures if protected from storms, draughts, dampness and great extremes in temperature. There is nothing, however, to be gained by exposing hens to outdoor temperatures when the thermometer is at or below zero. It is true that houses with entire open fronts may be built in such a way as to keep the hens fairly comfortable. Usually, however, this is done by reducing the height of the front to such a point that sunlight cannot penetrate to more than one-half the depth of the house, which necessitates admitting sunlight from the east and the west. Fig. 5 illustrates such a house with a front four feet high. If built 10 x 16 it will accommodate 40 fowls. There are no curtains to bother with, the front being left open at all times. This style of construction is perhaps not objectionable, but is impracticable in houses with more than one compartment. The type of house illustrated in either Fig. 4 or Fig. 6 is better adapted to average farm conditions and farm needs than any other type of house that has been thoroughly tried out. It is not practicable to increase the width of the house beyond 16 feet without adding disproportionately to the expense. It may be built narrower if desired, in which case a shed roof may be used instead of a roof of uneven span; but all the proportions and outlines of the house here illustrated have been worked out with great care, and unless there is some special reason for modifying the plan the house should be built as here indicated.

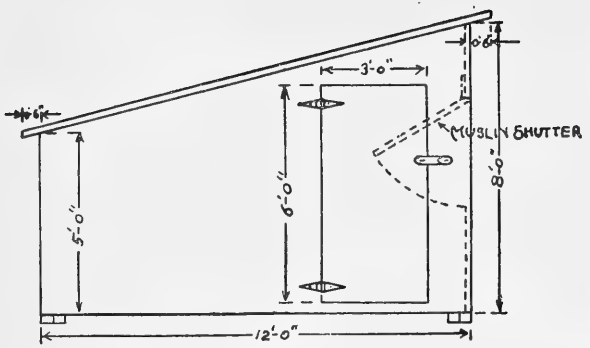
A complete bill for lumber and material is appended, and the house can be built with a dirt floor for $86 where lumber can be secured at the prices quoted in the estimate. A substantial board floor can be added at a cost of $22.50. A concrete floor with a solid six-inch concrete foundation can be laid at a cost of about $20, with concrete figured at 12 cents the cubic foot. In localities where cheaper material can be secured this house can be built for much less than the amounts mentioned above.

A House for Fifty Hens.

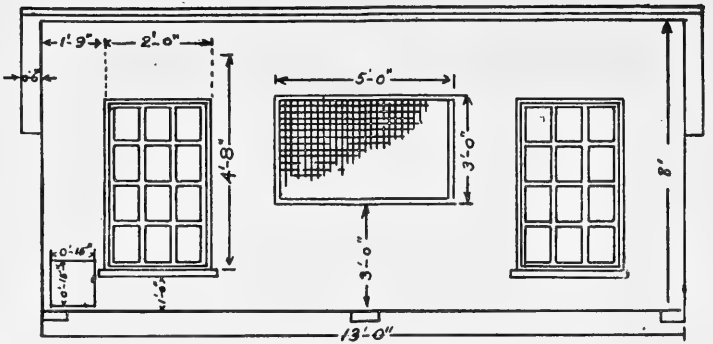
If it is desired to build smaller houses the one shown in Fig. 7 is recommended. It is designed to accommodate 50 hens. It is seldom desirable to build houses over 12 feet in width with shed roofs. A greater width than this demands inside supports, which interfere with daily work to a marked degree. A bill for lumber and materials is appended. At the prices quoted this house can be built with a dirt floor for about $50. A board floor will cost $13 additional. A cement floor with solid concrete wall can be added for $15.

Other houses in practical use are illustrated in Figs. 8 and 9.

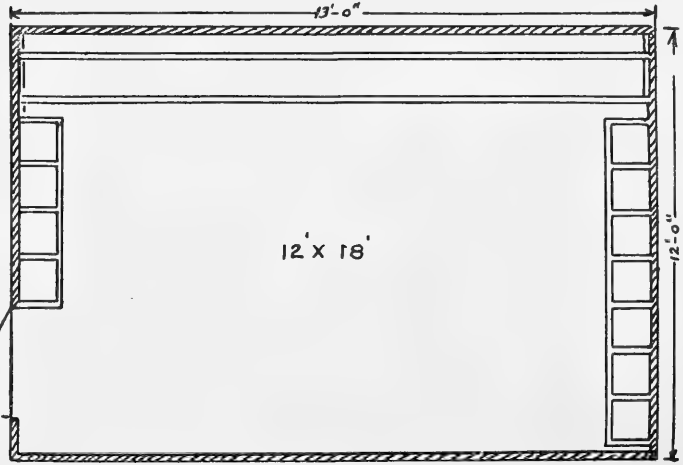
The poultry house should be located on a well-drained spot with a southern exposure and in a sheltered position if possible, but should be placed with reference to other buildings, so that the



END ELEVATION



FRONT ELEVATION



PLAN

Materials for House for 50 Hens.

Sills—	2 pieces 2 x 8 18 feet long.	
	2 pieces 2 x 8 12 feet long.	
Frame—	2 pieces 2 x 4 18 feet long.	
	20 pieces 2 x 4 8 feet long.	
	6 pieces 2 x 4 10 feet long.	
Rafters—	10 pieces 2 x 4 14 feet long.	
Perches—	2 pieces 2 x 4 18 feet long.	
Total, 400 sq. ft. @ $2.50		$10.00
Siding, 400 sq. ft. No. 1 grooved siding, @ $3.50		14.00
Sheathing for roof, platform, nests, etc., 325 sq. ft. @ $2.50		8.00
Stripping, 200 lineal feet, 1-in. x 3-in., surfaced		2.00
Roofing, two and one-half squares, @ $2.25		5.62
Windows, four six-light, 8-in. x 10-in., @ 90c		3.60
Hardware		4.00
Paint		3.00
Total		$50.22

Materials for Board Floor.

Joist—8 pieces 2 x 8 12 feet long, 128 sq. ft.	$ 3.25
Flooring—275 sq. ft. No. 1 pine, grooved	10.00
Total	$13.25

Materials for Concrete Foundation and Floor.

Walls—18 x 18 x 12 x 12, six in. thick, 3 ft. deep, 90 cu. ft., @ 12c.	$10.80
Floor—216 sq. ft., two inches thick, 36 cu. ft., @ 12c.	4.32
Total	$15.12

Figure 7—House for 50 Hens

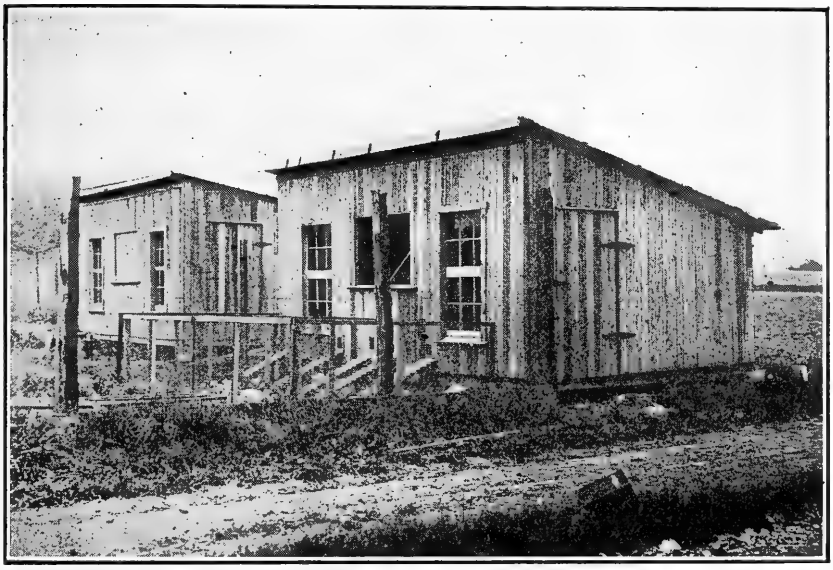


Figure 6—House for Fifty Hens—Brooder House in Summer

This is a photo of two houses built on the plan given in Figure 7. In this case the houses are used as brooder houses. For description of the use of the house see page 15

Figure 8—House for 100 Hens on an Ohio Farm

Figure 9—Open Front House with Hood

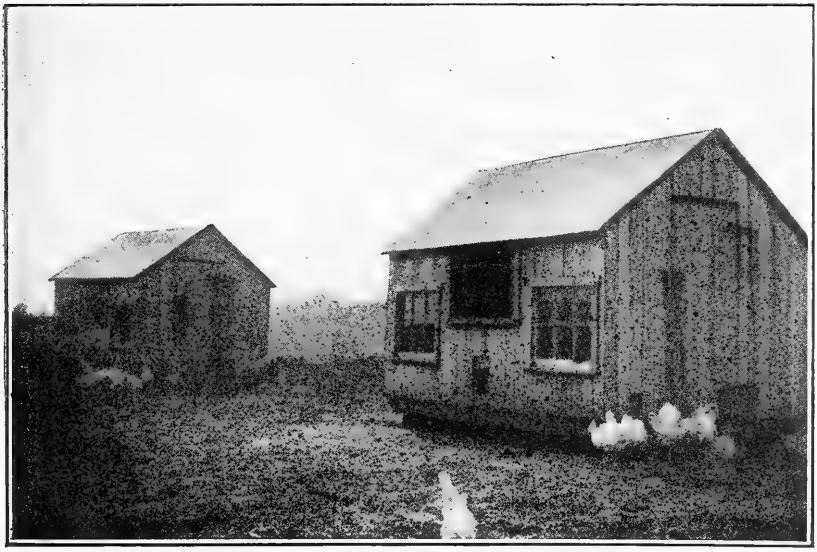


Figure 10—Portable Colony House—Used as Brooder House in Spring

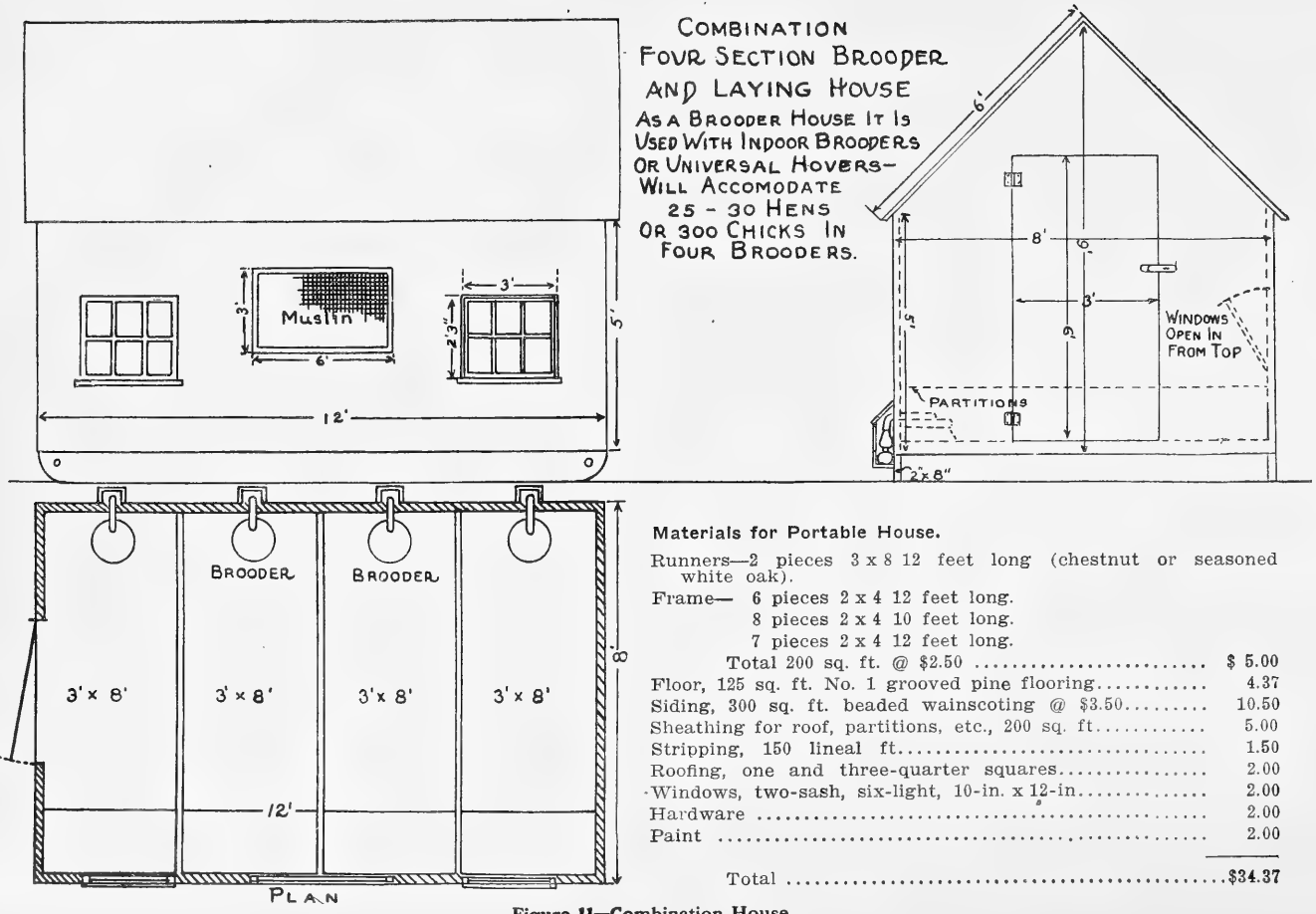
fowls may be cared for along with the other stock of the farm, avoiding as far as possible the necessity for special trips to the hen house. The house may be built very cheaply of rough lumber and covered with roofing paper, or ordinary grooved siding may be used and the house painted. If the lumber has to be bought at usual prices it will be found that the use of grooved siding is more economical than the use of rough lumber to be covered with roofing paper, while the building presents a much more attractive appearance and is more permanent and durable. The roof should be of a good grade of prepared roofing paper. Avoid the use of ordinary tarred roofing because of its lack of durability.

Floors.

The floor of the poultry house will be determined to some extent by the general location of the building. A dirt floor is always cheapest, and when it is raised above the ground level and thoroughly well drained it is a very satisfactory floor. However, the labor of removing the top dirt and refilling once a year, which ought by all means to be done, is an objection to this type of floor, as is also the fact that rats are likely to burrow in it. A concrete floor may be used under conditions in which a dirt floor would not be practicable, but if used it should be thoroughly insulated, as otherwise it will be cold and damp. The insulation is best effected by spreading between the concrete and the cement topping a layer of tarred felt, which completely prevents the water from rising from below. Insulation may also be secured by placing the cement floor on a filling of stone, gravel or sand. Care must be taken, however, to exclude rats which find such conditions exactly suited to their use. Under many conditions, however, a board floor is found to be most satisfactory. This is especially true in damp locations, where it is sometimes difficult to get good results until the floor of the house has been raised two or more feet above the ground level in order to insure dryness.

Portable Houses.

In addition to the laying houses there should be provided two or three portable colony houses of the type indicated in Fig. 10. These portable houses, to be used for brooding chicks and at various times through the year for the care of surplus stock, are really indispensable. If we are going to develop profitable business flocks on our farms, there must be proper conveniences provided and an opportunity to do the work as efficiently as possible, and the nondescript, miscellaneous brooding equipment on the average farm should have no place where the poultry business is viewed as a practical, money-making proposition. These portable houses, if built of light-weight lumber, like white pine or poplar, can be hauled from place to place with a



Materials for Portable House.

Runners—2 pieces 3 x 8 12 feet long (chestnut or seasoned white oak).	
Frame— 6 pieces 2 x 4 12 feet long. 8 pieces 2 x 4 10 feet long. 7 pieces 2 x 4 12 feet long. Total 200 sq. ft. @ $2.50	$ 5.00
Floor, 125 sq. ft. No. 1 grooved pine flooring	4.37
Siding, 300 sq. ft. beaded wainscoting @ $3.50	10.50
Sheathing for roof, partitions, etc., 200 sq. ft	5.00
Stripping, 150 lineal ft	1.50
Roofing, one and three-quarter squares	2.00
Windows, two-sash, six-light, 10-in. x 12-in	2.00
Hardware	2.00
Paint	2.00
Total	$34.37

Figure 11—Combination House

team, and should be moved frequently during the year so that the fowls will have clean ground. This is of special importance when young chickens are being brooded. These brooder houses are most conveniently utilized with adjustable hovers of the Universal type, four of which may be placed in one house, as indicated in Fig. 11, using movable partitions to separate the flocks during the first two or three weeks of their lives, after which the partitions may generally be removed.

Three of these houses will furnish accommodations for all the chickens that need be raised to keep up a 200-hen flock if brooders are used, and the temporary make-shift coops, boxes and outdoor brooders which litter the present farmyard should be disposed of. This will add very greatly to the efficiency with which the work may be accomplished. The matter of appearance in this connection needs more than passing mention. There is absolutely no necessity for the disreputable appearance of the average farm poultry plant, with its junk pile of odds and ends which have been given over to the poultry because no other use can be found for them. The poultry business is sufficiently profitable to warrant the provision of decent quarters for the stock and convenient facilities for carrying on the work. The poultry yard, instead of being an eyesore, ought to be as attractive and as neat as any other part of the farm, and it may be so with a little forethought given to planning the equipment and spending a reasonable amount of money.

Poultry House Furnishings.

The keynote of the poultry house interior should be simplicity. Practically the only essentials are perches and nests, though some other things may be added to reduce labor or waste when special occasion demands. The perches should be of two by four material, suspended on wires or supported by cross strips. The perches should be placed edgewise, with the top corners rounded off. It is desirable to have the perches smoothly planed. Seven to ten inches of perch room should be provided for each hen, and the perches should be about three feet from the floor and at the rear of the house, or along the north wall. This wall should be absolutely tight, and it is safer to line the wall immediately back of the perches with roofing so that there shall not be any possible chance of draught on the fowls while on the perches.

A dropping platform is not a necessity, but is preferred by many and is included in the plans given. Houses without dropping platforms require more frequent cleaning and use more litter, but probably save a good deal of time in the long run, as if dropping platforms are provided they must be cleaned frequently. Nests should be provided in the proportion of about one nest to every five or six hens. The style illustrated in Fig. 16 is convenient and

practical. They should be made about twelve inches wide and from thirteen to fifteen inches from front to rear and an eight-inch board used for the front. Nests may be located under the dropping platform if one is used, but there is less danger from lice if the nests are kept entirely apart from the roosting quarters.

While there is a good deal of loss from breakage in the winter time even with the best of care, water vessels of earthenware are the most satisfactory of the cheaper vessels available. A coop for confining broody hens should be provided at every house. This may be built in at one end of the perches, but on account of the danger from lice is better located entirely outside the house.

CHAPTER V.

BREEDING STOCK.

While the farm flocks of the country are generally of mixed breeding or no breeding at all, and in spite of this fact have astonished the country by the magnitude of the total value of the product, there is no doubt that the introduction of pure-bred poultry marks the beginning of really profitable poultry farming for the individual breeder. I do not believe that the mongrel farm flock is unprofitable, because the statistics of the industry in the country at large clearly prove that it is profitable. Nevertheless, the possibilities of the pure-bred flock are so much greater than the possibilities of the ordinary flock that there is no excuse for continuing to breed the latter. Doubtless extravagant claims are made for various breeds, and particularly for the so-called egg-laying strains, but there is no question about the fact that the careful breeder of pure-bred utility stock is able to furnish fowls that will mature more quickly, lay more eggs or reach greater size in a given time than will common stock.

It is only necessary to consider the results of the great egg-laying contest carried on by The National Stockman and Farmer a number of years ago to find ample proof for this statement, as far as it relates to egg production. In this contest were flocks representing nearly all the popular breeds as well as many flocks of good grade and mongrel stock, the latter never at any time making a particularly good showing. One of the most important advantages in the possession of pure-bred stock is the effect on the owner himself. There are few men who take a tithe of the interest in common stock that they do in pure-bred animals, and many a man's real interest in farming or stock growing dates from his acquisition of pure-bred cows, horses, pigs or poultry. The well-bred poultry flock operates more or less directly on the sympathy of the owner so that the housing, food and care that seem good enough for the barnyard fowl are seen to be clearly inadequate when better stock directs more attention to these things. As a result pure-bred flocks usually have a better chance and the results are correspondingly better. Quite probably the superior results often secured with pure-bred flocks are due as much to this better care and attention as to the stock itself. Whatever the cause may be, however, the fact remains that a pure-bred flock is almost invariably a better money-maker than the scrub flock—and that is reason enough.

Two Strings to the Bow.

Even if the pure-bred flock were not any better from a producing point of view than the common flock, the opportunity to sell

eggs for hatching and stock for breeding at double or twice double the ordinary market value opens up unusual opportunities for additional profit, and no one who is in the poultry business for profit can afford to ignore or neglect them. It is not necessary, nor desirable perhaps, that the average breeder should have the show-room in view. There is a growing demand for just good stock, suitable for foundation stock for farm and commercial poultry plants, where the extremes of the show-room are of no consequence. This does not justify the purchase or breeding of low-grade stock, as, for example, the culls from the yards of the show-room breeder. Just as every farm flock should be pure-bred, so every pure-bred flock should be well bred. One of the most important things to be settled in our minds in buying foundation stock is the fact that good stock can be secured only by paying the price. Our general standard of prices for commercial breeding stock is entirely too low. Only under exceptional conditions can one buy cheap birds that are worth breeding from. Good prices must be paid if a reasonably high standard is maintained.

Day-Old Chicks.

The man who has decided to invest in pure-bred poultry is confronted with the problem of how to invest his money to the best advantage and to secure the quickest returns. A great many are starting by buying day-old chicks, and often this seems to be the most satisfactory way to start. No chances need be taken with hens that will not sit nor with incubators that may not hatch well. On the other hand, the buyer of day-old chicks takes something of a chance in buying, especially early in the season, as many shipments of chicks get caught in changing weather while enroute and are injured and weakened before they reach the purchaser's hands. It is unfortunate also that many breeders and incubator operators are selling day-old chicks at prices too low to warrant furnishing stock of the grade that ought to go into breeding pens. So long as the purchaser understands what he is getting there can be no objection to this. Excellent laying stock may be raised from chicks bought at 10 to 15 cents each, but they are not of the grade that we ought to get for breeding purposes. The purchaser should realize that in the purchase of day-old chicks, as in other things, he is not going to get more than he pays for. Breeders are not, as a rule, selling day-old chicks from their best pens at low rates. It is only the cheaper stock that is utilized in this low-priced trade.

Buying Eggs for Hatching.

Where money for the venture is limited, probably the best way to start under present conditions is to buy eggs for hatching. There are often special reasons why eggs from very good stock

are selling at low prices, but generally it is necessary to pay what seems like an extravagant price to be sure of getting just what one wants. The modest few-line advertisements often announce eggs from flocks of small or unknown breeders who have stock of excellent breeding and at half the price of similar quality from breeders of established reputation. Except in such instances, however, and when buying without personal knowledge of the stock, it is better to pay several dollars a sitting than to lose the opportunity of an entire season through false economy. It is well to buy from those breeders who are at no great distance from the buyer's home. Eggs usually suffer more or less from long shipment, and hatches from eggs purchased from nearby breeders are much more likely to be satisfactory.

Buying Breeding Stock.

A quicker and more expensive method of getting a start is to purchase a trio or a breeding pen from which the buyer can produce his own eggs for hatching. He may in this way know more about what he is getting. The mere fact that one has paid $5 a sitting for eggs is no guaranty that the chicks hatched will be good breeders when they are raised. We often have the experience of buying eggs for hatching at long prices only to find when the chickens have matured that they are useless as breeders. This is not always the fault of the breeder. He cannot know certainly what is going to be the result of a mating, and it often happens that his matings, made in the best of faith, do not "nick" and he has lost an entire year and perhaps his reputation as well. The buyer of a breeding pen has this same risk to take, but at least he has a better chance to see what he is getting. On account of the expense, trouble and uncertainty associated with establishing a pure-bred flock by either method, many take the alternative of buying pure-bred males each year and mating with their original mixed or mongrel flock and gradually grading it up. This is a cheap and quick way of securing improvement, but it never results in securing a really pure-bred flock. While it is often practicable to grade up the general commercial flock in this way it should be looked upon only as a temporary expedient and every effort should be made to put the entire flock on a pure-bred basis as promptly as possible.

The Fallacy of Cross-Breeding.

A common and curious fallacy among many is that while pure-bred fowls should be secured for the flock it is better to cross-breed on the commercial farm than to stick to the same breed all the time. It is true that sometimes surprising results are secured by crossing breeds. It is also true that the advantage is temporary and the ultimate effect on the cross-bred flock is to

lose all uniformity of characteristics, and the last state of that flock is worse than its first. It is a fair presumption that whatever advantages may arise temporarily from cross-breeding are due to the introduction of new blood into a neglected or inbred flock, a result which could probably be secured just as well by the use of unrelated males of the same breed, leaving the flock still unimpaired from a breeding point of view.

The breeder who has been fortunate in securing his foundation stock is confronted with the problem of how to maintain the high quality which he may have secured and at the same time avoid the dangers of inbreeding on the one hand and on the other the danger of losing all that he has gained by the introduction of new blood which may not be as good as his own besides adding greatly to the expense of keeping up his flock by continual purchases. It should be understood that while inbreeding is not a matter which can be trifled with, and in the hands of inexperienced breeders is likely to result in deterioration, it is not true that inbreeding is in itself injurious, and with proper care to avoid the use of any but the strongest and most vigorous specimens in the breeding pen, inbreeding may be used to a considerable extent in the improvement of the flock without in any way injuring it. The usual objection to the purchase of high-grade males is that when their usefulness is limited to a single season it is not practical to pay the prices that are now being asked for really desirable breeders. For this reason the breeder should rather make up his mind to follow inbreeding to the extent, at least, of keeping good male birds for two or three years, and by thus increasing their period of usefulness be able to afford better stock than will be practicable if new males are purchased each year.

Farm Breeding.

While the extreme development of show points demanded for winners does not need to concern the farm breeder, he should have a clear conception of the special characteristics which are associated with the fowls which he is breeding, and he should study poultry breeding problems as seriously, at least, as he studies the breeding of his sheep, hogs or cows. Skill is a matter of experience and time, and it is entirely outside the province of this work to give specific instructions along this line.

Of almost equal importance is the study of the more practical problems connected with breeding, such as constitutional vigor and the proper feeding and management of the breeding stock. Under the conditions which characterize most commercial plants the constitutional vigor of our fowls needs careful attention. The constant tendency among most breeders is toward deterioration in this respect, and the continual complaints of losses in breeding stock, poor hatches and the appalling prevalence of chick diseases are all

Figure 12—Portable Brooder Houses—Heated by Coal Stoves. From 300 to 500 Chicks are Brooded in One Flock in Each House

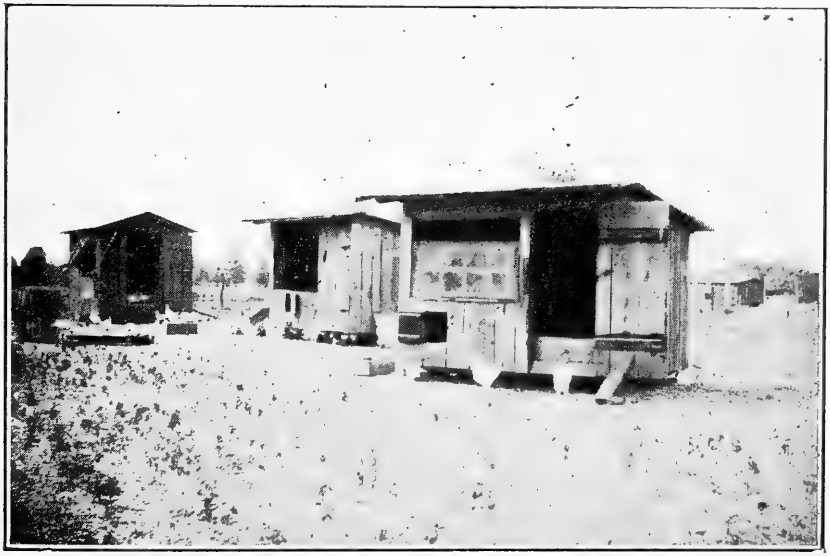


Figure 13—Portable Colony Houses—Used as Laying Houses in Winter, and Brooder Houses in Spring

Figure 14—Portable Brooder Houses

Figure 15—Colony Houses Used in South Shore District, Mass.

largely due to lack of attention to the constitutional vigor of our flocks. At the beginning of the breeding season all the fowls that are to go into the breeding flock should be carefully examined, and those which show any indication of physical weakness should be removed, regardless of their desirability in other respects. Fowls with dull eyes, pale combs, flat, narrow breasts, unusually long legs or necks, narrow faces, hawk-like bills, awkward in their carriage, unsteady on their legs or presenting any indications of weakness or lack of vigor such as would be apparent to any breeder on a careful examination, are not birds that should be continued in the breeding pen. Neither should any fowls be included in the breeding pen that have ever given any indication of weakness or lack of thrift at any time either as chicks or adults, regardless of how they may appear at the time the breeding pen is being selected. The females in the flock should be one and two-year-old hens rather than pullets, since the latter are likely either to be immature in development or perhaps have been laying all through the winter and are not in fit condition for breeding.

The management of the breeding flock through the winter season should be entirely different from that of the laying flock. The ration should be less forcing in its nature, should consist largely of whole grains, and as much exercise as possible should be secured by scattering all grains in deep litter, so that practically all of the feed must be worked for. Exercise, green food, a thoroughly well-ventilated house and as much range as the weather will permit are all important aids to securing high physical condition, which is an absolute essential in the breeding flock. As the hatching season approaches a regular laying ration may be fed, but forcing rations should be avoided at all times. It has been found by repeated experiments, both with fowls and with other classes of livestock, that the presence of a considerable proportion of corn in the ration is conducive to high fertility and vitality. It is important, however, to see that the hens are not overfat, and with some breeds it is necessary to limit the corn to a comparatively small part of the ration, though it can be fed freely to any flock if the hens are compelled to take plenty of exercise. The fertility of eggs will usually be at its highest point early in the spring, shortly after the fowls can have access to yards or range, when the grass is beginning to grow, and before the fowls have been exhausted by long laying.

Usually March and April are the best months for hatching, particularly with general-purpose breeds. However, chicks that are hatched during the first two weeks of May grow rapidly and may, with proper care, reach maturity almost as soon as those that are hatched a couple of weeks before. Unless special attention is given to breeding, the farm poultryman will usually find it most satisfactory to use his entire flock of one and two-year-old

hens for breeding, which we are assuming will number about 100, or will be left in flocks of that number. For such a flock he should have about six to eight males and generally will find the results more satisfactory than where small breeding flocks are kept and mated with single males.

CHAPTER VI.

INCUBATION.

Eggs may be saved for hatching five days after the pens are mated and under ordinary conditions should be set as soon as possible after they are laid. There is a noticeable decrease in the hatchability of eggs that have been kept more than two weeks. Eggs may be kept for this length of time in ordinary cellars or living rooms, and it is not necessary to give any special attention to position or to turning. If they are kept longer than two weeks they should be turned daily, and experiments indicate that the best results will be secured when the eggs are laid flat rather than placed on end. Eggs for hatching should be carefully looked over and those that are in any way abnormal in appearance should be discarded. Small eggs are seldom desirable for incubation, as the chicks are not so likely to be strong and vigorous as those from medium or larger eggs. No incubator manufacturer has yet succeeded in making an incubator that will do better work than the sitting hen, and it is entirely practical to use hens for hatching chicks in considerable numbers if proper provision is made for them. It is not desirable to hatch with hens that are permitted to sit where they have laid, as the losses are out of all proportion to the results secured. If hens are to be used for sitting they should be placed in a room devoted exclusively to this purpose and provided with convenient nests. Large numbers of hens may be set in a single room and the labor of caring for them reduced to little if any more than would be required for incubating a similar number of eggs in incubators. In the Little Compton District of Rhode Island, where every farmer is a poultryman and where each one hatches several hundred or even several thousand chicks a year, hens are depended on quite generally for hatching.

A Setting Room.

The setting room should be provided with convenient nests of uniform appearance and size. They are most convenient when made in sets of two or three, and if provided with tight bottoms may be placed one on top of another, as in accompanying illustration. The broody hens should be placed in these nests at night, and with a little care will settle down quietly. They should be confined to the nests and let off regularly each morning in lots of ten or more and returned to their nests in ten to thirty minutes, depending on season, stage of hatch and so forth. It is not necessary that each hen be returned to the same nest. Shelled corn,

water, a little green food and a dusting place constitute all the provision that need be made. The hens should be dusted with insect powder when set and a couple of times during the hatch.

Incubators Indispensable.

Under ordinary conditions, however, the poultryman who is keeping a flock of 200 hens or more will find incubators indispensable, not only as a means of economizing in labor cost, but also because it is only by the use of incubators that he can hatch his eggs sufficiently early in the season to get winter-laying pullets. He can also in this way get the chicks hatched and started before the pressure of other spring work has begun. The poultryman or farmer who keeps Leghorns must, of course, depend entirely upon artificial incubation at all seasons, as Leghorns while not exactly non-sitting are so unreliable that it is seldom practical to use them for this purpose.

It is not always an easy matter to learn to operate incubators successfully, but the man who is making the poultry industry an important part of his work can well afford to give the subject the attention that is needed in order to master the art. There are many good incubators on the market and choice is largely an individual matter. Most incubator manufacturers are glad to send their machines on trial, and it is generally better to buy that way. If the incubator selected does not give good results under the buyer's conditions it is probably better for him, after having given it a fair trial, to return it to the manufacturer and try one of a different type. It is common knowledge that individual operators get widely different results with different machines under the same conditions.

Generally speaking, large machines are more economically managed than small ones, and the man who has a flock of 100 breeders will not find it advantageous to purchase anything smaller than a 200 to 250-egg size. The incubator, however, should not be so large that it cannot be filled with eggs under one week old. For a 200-hen flock, one 250-egg machine may be sufficient if several hatches are made, but the farmer will usually find it cheaper in the long run to have two or three machines and hatch all the chicks that he needs in two hatches, as it greatly reduces the labor cost of raising the chicks after hatching and simplifies their care. It is not necessary to provide a separate building for the incubators if there is room for them in the house cellar. It is important in this connection to examine your insurance policy, and be sure that the incubator you buy is acceptable to insurance companies or that you have an individual permit from your insurance company to operate incubators in the cellar. It is not wise to operate incubators in a dwelling house without taking this pre-

caution. There is not the slightest danger of fire with standard makes of incubators if properly run, but it is unwise to risk vitiating insurance by operating without a permit.

Follow Directions.

Manufacturers of incubators send out comprehensive directions for the operation of their own machines, and it is of the greatest importance that the operator shall familiarize himself with these directions and follow them with the utmost care. Most of the failures to get good results with incubators are directly due to the failure to follow directions. There is little need to give here general directions for operating machines if the operator will follow carefully and painstakingly the directions which are supplied with his machine. If he will not do this no additional volume of instructions will be of any value to him. In case good results are not secured the manufacturer of the incubator can usually be of more assistance than any one else, and he should certainly be consulted first and last in regard to the operation of his machine. It may be of some assistance, however, to call attention to a few special points that are important in successful operation. The chief problems in artificial incubation are the proper regulation of temperature, ventilation and moisture. To a considerable extent all of these matters are the manufacturer's problems rather than the operator's. It is absolutely impossible to take care of either entirely automatically, however. In the best machines temperature is quite accurately regulated but I should like to call attention to a feature which is generally overlooked in connection with this regulation and that is the importance of securing the proper average temperature.

Importance of Correct Average Temperature.

It is not enough that the temperature should run uniform from morning to night and from night to morning. As a matter of fact extreme uniformity is not of any particular importance provided that when irregularities do occur they are properly offset by corresponding variations the other way. The incubator operator need not be disturbed if his temperature fluctuates one or even two degrees on either side of the normal temperature of 103 which is usually assumed to be the correct average with contact thermometers, provided the fluctuation is as much one way as the other. The time spent in turning and in cooling the eggs, and the rapidity with which the incubator brings the temperature back to 103 after turning or cooling should be taken into account. The cause of premature or delayed hatches lies in the operator's failure to secure the proper average, so that the total of his heat units for the day or the week or for the entire hatch averages

too low or too high. The proper average can be ascertained only by a careful keeping of records, which should include not only frequent daily readings but also a statement as to the length of time for which the eggs have been cooled and the exact time during which the temperature has been above or below normal. A sheet similar to the sample given herewith should be used in keeping a record of each hatch, and will be of great value in ascertaining the cause of poor results if such are secured.

DAILY INCUBATOR RECORD.

Number of Machine..... Date of Starting.....

Day of Hatch	Day of Month	TEMPERATURE				How long Cooled	Room Temp.	REMARKS
		M'ning	Noon	Night	Av'ge			In the column headed "Remarks" note everything from day to day that may have any bearing on hatch. If temperature runs high during day, record maximum reading; if low, record lowest, and in each case give time temperature nas been high or low. Record all changes in regulation, adjustment of ventilation; and weight of eggs if weights are taken to determine evaporation. Temperature readings and turning should be absolutely regular. If not, all variations should be noted in this column.

Gauging Evaporation.

The usual directions for ascertaining the proper amount of evaporation provide a verbal description, or a chart showing in outline the development of the air cell for certain periods during the hatch. The expert operator can usually tell whether or not he is securing the proper amount of evaporation by studying the size of the air cell with an egg tester, but the beginner will find it almost impossible to do this with any accuracy. It is much better to determine the evaporation by weight. Eggs should lose from 12 to 14 per cent of their weight during the first 18 days, the amount of evaporation gradually increasing from the beginning of the hatch to the end. The operator, therefore, who will weigh the entire tray or a selected number of eggs and so govern the evaporation by the regulation of ventilation or the supply of moisture that he gets an evaporation of about three and a half per cent during the first six days, four per cent from the sixth to the twelfth day and five and one-half per cent from the twelfth to the eighteenth day may know without any question that his evaporation is nearly normal. Successful artificial incubation is not a particularly difficult matter and depends solely upon regular care, faithful attention to all the necessary details of the work,

and if the eggs come from breeding stock that is in vigorous, healthy condition there should not be any trouble in getting reasonably good hatches. It is advisable in all cases where artificial incubation is being learned to set at least a few hens at the same time the incubator is set and to compare the development of the germ and the air cell at intervals during the hatch.

It is not expected that the incubator will, on the average, give as good results as will hens. This is true for various reasons outside of the mere fact that the incubator is an artificial method; but the results will be almost as good if the work has been properly done.

Why Embryos Die on Eighteenth Day.

The large number of complaints which come from incubator operators in regard to chicks dead in the shell indicates that there is a general misunderstanding in regard to the conditions affecting incubation. The eighteenth to the twentieth day in incubation is a critical time in the life of the embryo and the time at which nature settles accounts with us for everything we have done that was wrong, from the mating of the breeding pen to the management of the incubator. Eggs may show high fertility and the embryos apparently have plenty of vigor, and yet succumb about the eighteenth day. Low constitutional vigor in the breeding pen, improper conditions of feeding and housing, holding eggs for too long a period before incubation, exposing them to too high or too low temperatures during the same time, and failure to follow carefully the various directions given for the successful operation of the incubator are all responsible for the death of large numbers of chicks on and after the eighteenth day. The fact that chicks have developed until this time and have then died is not therefore any proof that conditions have been right up to this point and that something wrong has developed at this period of the hatch. In nearly every instance the trouble dates back of the eighteenth day. Very frequently, however, the heavy losses that ensue from the eighteenth to the twenty-first day may be reduced by more care in handling the machine at this time, being particularly careful not to allow the temperature to run too high or the moisture in the machine too low. Chicks that succeed in pipping the shell may often be saved by added moisture, which is best supplied in most machines by wringing a woolen or a cotton cloth out of hot water and spreading it over the eggs. The presence of "stickers" in the machine is often due to insufficient moisture during the latter part of the hatch.

CHAPTER VII.

BROODING CHICKS.

While much may be said in favor of hens for hatching, it is rarely profitable to depend upon them for brooding chicks when considerable numbers are to be raised. The labor cost is out of all proportion to whatever advantages may be gained. If hens are to be used, however, the provision of a convenient and safe brood coop will assist greatly in preventing many of the difficulties and losses which generally accompany brooding with hens. The coop illustrated in Fig. 20 will be found to be convenient and

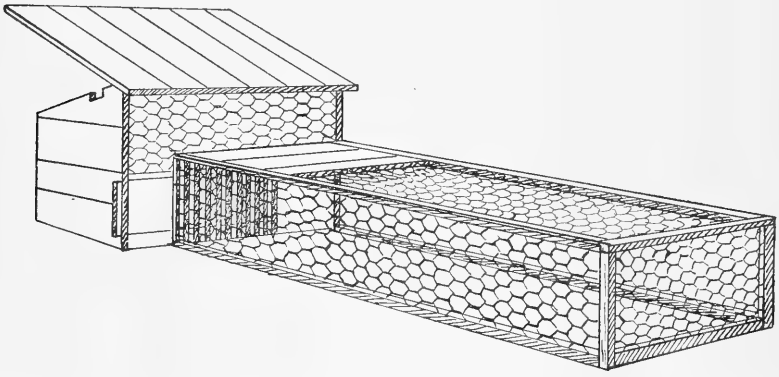


Figure 20—A Handy Brood Coop

efficient under practically all conditions. This coop is about two feet deep, two and a half feet long and two feet high in front. It may be built very cheaply by using store boxes or second-hand lumber, and when provided with covered runs, also shown in illustration, gives excellent results. Do not make the mistake of building too cheaply, however. If built of good sound lumber they will last a long time and there is real economy in building in this way. For use early in the season the upper part of the coop front should be provided with a muslin-covered frame, which will add greatly to its warmth. The covered run should be about four by eight feet, fully fifteen inches high and covered on all sides except the bottom with one-inch mesh netting. Chicks and hen should be confined to the coop and run for the first month or until settled weather.

Artificial Brooding.

In raising chickens on a larger scale, however, brooders are indispensable. It is hardly worth while to try to maintain a large

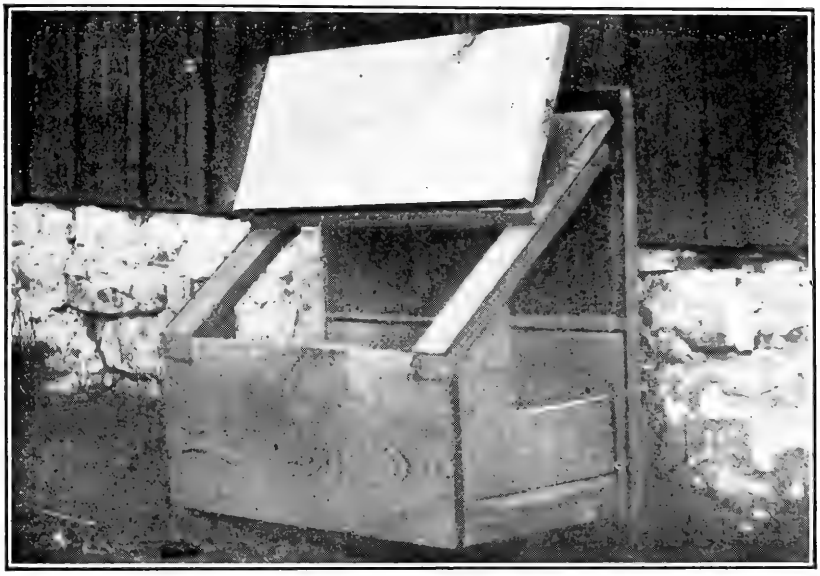


Figure 16—Convenient Nest for Poultry House

Figure 17—A Pure-Bred Farm Flock

Figure 18—A Corner in a Setting Room

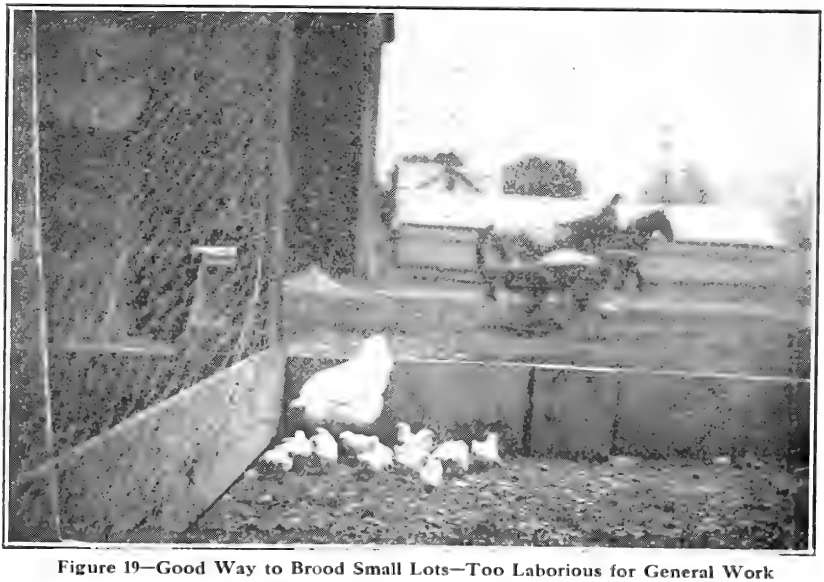


Figure 19—Good Way to Brood Small Lots—Too Laborious for General Work

flock of fowls until you have reason to believe that you can make a success of artificial brooding. The type of brooders in general use at present makes this a much simpler matter than it was a few years ago, and there is no occasion for failure if reasonable care and attention are given to the work. Brooders are provided for use both indoors and out, and under some conditions the latter is desirable and convenient. In the long run, however, it will be found that indoor brooders and colony houses are greatly to be preferred to the use of outdoor brooders, and I strongly advise adopting the indoor brooder method of handling the flock. For this a portable colony house must be provided, and the one shown in Fig. 11 is particularly convenient. Such a house, equipped with three or four hovers of the Universal or Adaptable type and with temporary partitions, will care for 200 to 300 chicks very satisfactorily. After the chicks become large enough to cross over the partitions these may be removed, and when the chicks no longer need heat the hovers may be replaced by perches. A few of these houses will be found serviceable all the year round on any farm, but their use for laying flocks is not recommended save in emergencies. Not more than 25 to 35 hens can be properly accommodated in a house of this size, which makes the flock too small for practical purposes.

The operator of lamp-heated brooders, should be particularly careful to avoid the danger of fire, which must be reckoned with no matter what type of brooder is secured. Home-made brooders are not to be recommended. The fire risk with such is usually extreme, and their use is to be discouraged for that reason, if for no other. Brooders should not be located near other buildings and particularly should be kept at a safe distance from barn or dwelling house, and every care taken to keep the lamps clean and in proper working order.

Lampless Brooders.

Many are attempting to escape the care of lamps and the danger from fire by the use of "lampless" brooders. It is quite possible to use brooders of this class to advantage in emergencies, and in warm weather, but the tendency on the part of many to substitute cold brooders for heated brooders at all seasons should be discouraged as the result of so doing is likely to be disastrous. Stunted growth and susceptibility to disease are common tendencies among chicks so brooded. Lowered vitality and loss of constitutional vigor are almost inevitable. Young chicks need some supplied heat, and the effort to keep them warm by confining their own heat under the hover results generally in insufficient ventilation, damp brooders and mouldy hover cloths—each a most prolific source of disease. The labor cost of raising chicks in lampless brooders

is even greater than with hens and results are much less satisfactory in the long run.

Feeding Chicks.

The precise method of feeding young chicks and the choice of foods is of little importance, comparatively, if the brooding and the daily care are what they ought to be. It is the care rather than the precise method that counts. Some things, however, seem to make success easier than others. It is not necessary or desirable to feed chicks as soon as they are hatched. If you will watch the mother hen you will see that she makes a great deal of fuss when food is given, but usually ends by eating it all herself—and that is the best thing she could do. At the same time it is not well to tie one's self down to the unvarying observance of the rule of never feeding chicks until they are 48 hours old, or 72 as some advocate. The safest rule is to watch the conduct of the chicks and let them have their first feed as soon as they seem to need it, after the first 24 hours. The first feeds should always be very small, and the surplus should be promptly removed. The simplest and safest food for general use for the first two or three days is bread-crumbs slightly moistened with water or milk. After a couple of days of this, chick food should form at least half of the day's ration. Chick food is a commercial preparation put up by various dealers in poultry foods and consisting of a number of finely-cracked grains mixed in varying proportions. Home-mixing of chick food is practicable. A good formula is equal parts of finely-cracked corn, wheat and pinhead oats, with very small amounts of hemp, millet, cracked Kaffir corn and such other grains as may be available, though it is questionable whether there is any real advantage in using anything in addition to corn, wheat and oats. The average poultryman, however, will find it difficult to obtain these foods ground to proper size and sifted to avoid waste, and will ordinarily be able to buy commercial chick food cheaper than he can prepare his own mixture and in better condition for use.

After two or three days bread-crumbs may be omitted and various substitutes may be provided. Pone, composed of corn meal with a small quantity of bran and middlings, makes an excellent substitute for bread. Ordinary corn cakes are sometimes used. Rolled oats mixed with a limited amount of hard-boiled egg is preferred by many, while a mash of scalded corn meal mixed with small quantities of bran and shorts is perhaps as good as anything. In the preparation of this mash boiling water should be stirred into corn meal until it is mush-like in its consistency, and then fine wheat bran and shorts, about one pound of bran to one and a half pounds of shorts, should be stirred in until the mixture becomes quite stiff and crumbly. Wet mashes should always be

so mixed that no free moisture will be observed when the mash is squeezed in the hand. No matter what kind of soft food is used not more than half the day's rations should be in this form. During the first month or six weeks of the chick's life it should have four or five feeds a day. The morning and evening feeds should be some form of soft food, of which the chicks may be permitted to eat all they will in five or ten minutes, after which the surplus should be promptly removed. The two mid-day feeds should be chick food in litter. There is a number of other rations that are as good or possibly better, but these foods are cheap and within the reach of every one, and if properly fed will give good results. Little and often, nothing mouldy, nothing sour, nothing sloppy and nothing to excess will make any feeding system safe and successful, without much regard to what is used or the proportion in which it is fed.

Feeding Growing Chicks.

After the chicks have been fed on this ration for four or five weeks the chick food may be gradually dropped and cracked corn and whole wheat supplied in its stead, thus reducing the cost of the ration. During the first month of the chick's life, especially if confined to runs or yards, care should be taken not to overfeed. As soon as the chicks are able to get out on the range, however, they should be fed all they will eat. There is no danger of overfeeding an active young chicken, and under ordinary conditions after reaching the age of two months it will be found entirely practical to use hopper feeding methods with chicks on the range, to some extent at least. There are few flocks of growing chicks, even on the farm, that will not be benefited by having kept constantly before them a hopper or low box containing cracked corn, dry mash and meat scrap, using the same mash mixture with which the laying hens are supplied. Better results will be secured if in addition to this hopper feeding one or two daily feeds of wet mash and wheat or other grain are also supplied.

Fed in this way little special care need be given the growing chicks after two months of age except to see that their coops are kept reasonably clean, that their houses are provided with the additional ventilation that will be necessary as the chicks increase in size, and to carefully avoid all overcrowding. This is generally most conveniently done by separating the sexes and either selling the cockerels as broilers or removing them to other quarters. If this is done the latter part of the summer, using the colony houses of type shown in Fig. 10, each house will comfortably accommodate 100 to 125 pullets until they are ready to go to laying quarters in the fall. Pullets so treated will grow more rapidly and begin laying earlier in the fall than is possible when they are crowded at night in hot, ill-ventilated brood coops or small brood-

ers which they have long outgrown. If Leghorns are being raised care should be taken during early fall not to permit the pullets to mature too rapidly. If hatched in April it is easily possible to bring Leghorn pullets to maturity in September. There is no advantage in so doing, however, for after laying a few eggs they are likely to moult and will then be non-productive until the following spring.

Feeding for Early Maturity.

There is little danger of too early maturity with pullets of the dual-purpose breeds unless hatched extremely early. Usually it is necessary to give some special attention to feeding for early maturity in order to get them laying by the first of November. Strictly speaking, feeding for early maturity should mean feeding for rapid growth and should result in bringing the fowl to full size in the shortest possible time. In general practice what is meant by the term is not so much rapid growth as feeding to check growth. Pullets will not lay while they are growing rapidly, but if, when they are well grown, further development is checked by increasing the fattening tendency of the ration and by stimulating the egg organs by a considerable proportion of animal food they are likely to begin laying quite a little earlier than they would normally. This means in practice that the corn and other fattening foods which make for fat rather than growth are increased, the pullets get plump, and egg laying follows as a natural consequence. When the flock is intended solely for the production of eggs for market this is a practical method to follow, but it would be decidedly objectionable to follow it in the case of pullets that were intended for the next season's breeding pen.

CHAPTER VIII.

FEEDING FOR EGG PRODUCTION

The poultryman is not able to feed with scientific accuracy because the nutrition of fowls has been very imperfectly studied. Just because we do not know all that we would like to know, however, is no excuse for saying that we know nothing and may as well go it blind. Enough careful feeding experiments have been made to give us a thoroughly practical basis for planning our feeding, which is much better than trying everything out experimentally.

The Nutritive Ratio.

By nutritive ratio is meant the proportion existing in the ration between the protein, or flesh-building nutrient, and the carbohydrates and fat, or the heat-making nutrients. It may be doubted whether the best nutritive ratio for practical feeding has been fully determined as yet. Opinions and practice differ widely. Much depends on whether the flock is looked upon as a permanent one, or one which may be fed for quick results regardless of the ultimate effect of the ration on the health of the flock. Probably most feeders are aiming at a nutritive ratio of about 1:5, running a little wider in the winter and somewhat narrower in the summer. This seems a safe ratio for the permanent flock if estimated on the basis of crude nutrients rather than the so-called digestible nutrients. Not enough is known as to the digestibility of the various foods to make it possible to make exact estimates on this basis. In any event, the practical feeder has to meet a condition as well as a theory, and it is safer to err on the side of having the ration a little too wide rather than too narrow. Fowls with a fair opportunity to balance their own rations rarely make up narrow rations, which would seem to be a hint worth taking.

Taking the values of crude protein, starch and fat as presented in the ordinary tables of food analyses, therefore, one pound of crude protein to five pounds of carbohydrates and fats raised to carbohydrate values, is about the best proportion in which these nutrients should be combined in the ration. The usual instructions for working out this nutritive ratio, while comparatively simple to the experienced feeder, are too complicated for ordinary use, and it is plain that we need a simpler and easier method of computing our rations, so that we may keep closer to the lines that have been proved to be safe and practical but without being in-

volved in the complicated calculations necessary in working out exact nutritive ratios.

Feeding by "Total Protein."

This can be done by abandoning the use of the term "nutritive ratio" and estimating our rations on the basis of crude protein alone, and this method is adopted in the following discussion of feeding. Without taking space to explain how the proper proportion has been worked out, it is assumed that the amount of protein which a good laying hen of average size will need daily is from .55 to .65 of an ounce. Repeated tests have shown that laying hens weighing on the average five pounds will consume about four ounces of feed daily, and to get the total amount of protein needed in a four-ounce ration will require one in which 14 to 16 per cent of the total weight is in the form of crude protein. If given the opportunity to select her own ration from a proper assortment of foods, the average laying hen will approximate these proportions. Taking 15 per cent of crude protein, therefore, as the basis, the computing of a trial ration becomes fairly easy. It is desirable that the proportion of protein in the ration should not vary widely from this figure for practical reasons, though it is probably better to err on the side of less rather than more. If the ration carries much more protein than this it will be found that the cost is excessive, because protein is always our most expensive nutrient, and there is no practical advantage in feeding it in a larger proportion than the needs of the fowls demand. Excessive feeding of protein long continued will be injurious to the health of the fowls. It is sometimes practical to reduce this proportion, but if it is materially reduced the hen, in order to get the weight of protein which she needs each day, must consume a much larger total weight of food and the increased food consumption makes an unnecessary tax upon the digestive organs.

Crude Fibre.

Contrary to common belief, the proportion of crude fibre which should enter into the ration is decidedly low, but the health and efficiency of the hens may be greatly affected by too much or too little fibre, or, as it is sometimes expressed, "bulk." The proper proportion of crude fibre as ascertained by repeated experiments is about 3.5 per cent. In ordinary feeding, then, the only points that must be carefully reckoned are the percentages of protein and crude fibre.

Computing Rations.

To illustrate this method of computing rations let us make up a simple one, using corn, bran and meat scrap. For ease in making

computations trial rations should be in 100-pound lots or multiples of 100. If we take a trial ration of 300 pounds of corn, 100 pounds of bran and 40 pounds of meat scrap, we shall have a total of 440 pounds of feed, of which 67 pounds is in the form of crude protein and 15 pounds of crude fibre, as shown in the accompanying table:

	lbs.	Crude protein lbs.	Crude fibre lbs.
Corn	300	30	6
Bran	100	15	9
Meat scrap	40	22	—
Total	440	67	15

Dividing 67 and 15 by 440 we find that this ration would provide 15.2 per cent of protein and 3½ per cent of crude fibre. A hen eating four ounces daily of this ration would get .60 of an ounce of protein. The ration given above is not offered as a practical ration, but merely as an illustration of how to estimate values on the basis suggested, considering simply the proportions of crude fibre and protein. There are a few poultrymen, however, who are feeding just about such a ration as this to their flocks and who consider it a thoroughly practical one. It does not measure up to the ideal ration in many particulars, however. In the first place it lacks variety.

Value of Variety.

While there is no magic in variety itself, and the average fowl does not seem to care greatly for it, every feeder who studies the appetite and performance of his hens knows that with a ration that consists of so limited an assortment of foods the fowls will sooner or later lose their appetites and the egg record will suffer, if not the health of the fowls as well. It is possible to feed such a ration indefinitely with a fair degree of success while the fowls are on open range, but they are never likely to reach a high average of production. The most important thing in feeding for eggs is to get the hens to consume large quantities of food, without which there can never be large production of eggs. One of the most important aids in accomplishing this result is providing reasonable variety in the ration.

Hens have personal preferences as well as people, and what is acceptable variety to one hen may not be so to another. Experiments with hens of the same breeding, age and previous treatment have shown that all do not like the same things and probably will not do equally well on any uniform ration. The necessity for variety, therefore, does not seem to be due so much to the fact that the hen prefers a wide range of choice in her feeding, but rather that hens have individual preferences, and these must be suited if they are to do their best.

To get back to our corn, bran and meat scrap ration again, it is apparent that this does not offer much choice, and actual

experiments with this ration have shown that its continued use will result in very moderate production. In choosing additional feedstuffs we must be governed largely by availability and economy. Many things might be used to advantage in feeding hens that would not be practical on account of the cost. With the exception of meat scrap it is doubtful if it is ever necessary or profitable to pay over two cents a pound for any kind of poultry food. The average cost of the farm ration ought not to exceed one and one-half cents a pound under ordinary conditions, and the poultryman must have an exceptional market for his products if he can profitably feed a ration the average cost of which exceeds two cents a pound. If now we wish to correct our initial ration so as to introduce more variety, keep the cost down to a practical figure and still provide the proper percentages of protein and fibre, we shall have to consult the accompanying table and select the foods that are cheapest, most palatable and most easily secured. Cheapness does not, however, necessarily mean the lowest price per pound. Different grains have different feeding values as measured by their digestibility or even palatability, and both points should be considered in making up the ration. Wheat is one of our most valuable grains and should be used liberally when price makes it economical to do so. Buckwheat and oats, which closely resemble corn in their analyses, though carrying considerably more fibre, are excellent foods, though usually too expensive for general use unless grown at home. Other grains may be used when price makes it an object, but it is doubtful whether there is any real advantage in making a special effort to supply them and there is reason to believe that the scratch feeds which contain a considerable variety of different grains are fed with a good deal of waste. There is also considerable danger of introducing many noxious weeds in purchasing mixed grains.

The Mash.

The mash, a term applied to a mixture of ground grains, fed either moistened or dry, figures quite largely in poultry feeding and is practically indispensable. Most of us would be glad to omit it if it were possible to do so and get good results, because it is the most difficult factor to reckon with in feeding, but we cannot escape the fact that hens will do their best only when a portion of the daily ration is in the form of mash. There is a number of reasons for this, some of them understood and some probably not understood. The important thing is that it is so. The by-products which are used chiefly in compounding the mash can be secured more cheaply than whole grains. The mash also seems to stimulate appetite and digestion, and we are able through its medium to introduce safely the extra protein that is needed to reinforce the common grains.

Figure 21—Brood Coops in Little Compton District, Rhode Island

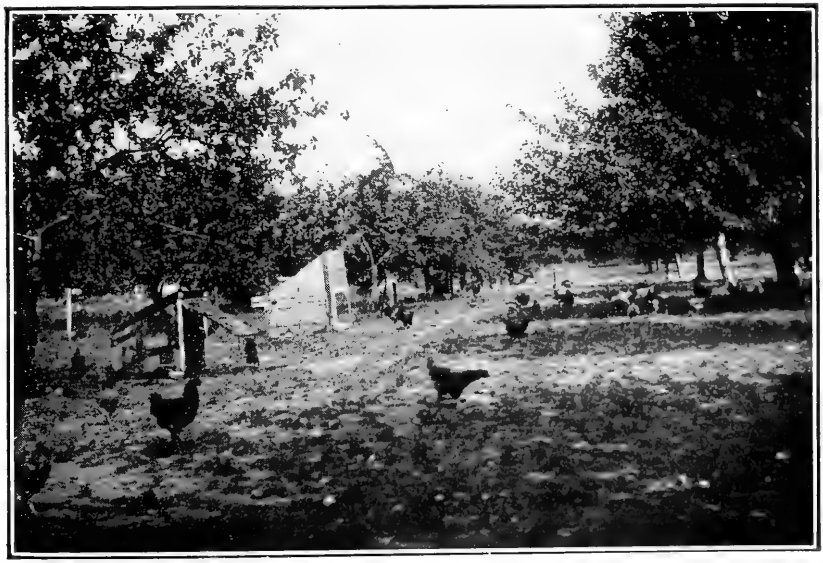


Figure 22—Growing Chicks in an Orchard—An Ideal Place for Brooders and Brood Coops

Figure 23—Raising Chicks in the Pasture Field—A Good Place but Lacks Shade

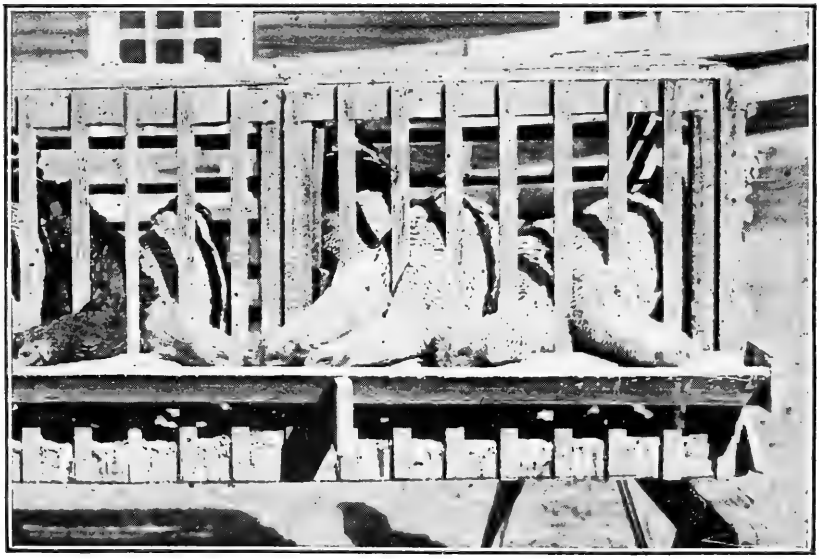


Figure 24—Fowls Feeding in Fattening Crates

It is comparatively easy to prove mathematically that bran is too expensive for its actual feeding value, but the practical poultryman continues to use it as the basis of his mash because he knows that it brings better results and keeps the fowls in better condition than can be done without it. It seems to have some merit that is not accounted for in the feeding tables. Theoretically alfalfa should be a satisfactory substitute for bran, and when home-grown should be much cheaper. Experiments, however, have shown that alfalfa does not give as good results as does bran in ordinary feeding. To bran most feeders add as large a proportion of middlings or shorts as can be used without making the mash sticky or gummy. Corn meal is usually added, partly to improve the mechanical condition of the mash and partly to increase its palatability. Ground oats, if not too expensive, may be advantageously added. Frequently this is the only form in which oats can be fed without serious waste. Meat scrap or some other form of animal food is an essential part of practically all our mash formulas. To these feedstuffs are sometimes added oil meal and gluten, the oil meal largely for its beneficial effect upon the digestion of the fowl and gluten as a cheap source of protein.

Advantage of Complicated Rations.

When all these foods are introduced into the ration it is decidedly complicated, and, as some believe, entirely too complicated for practical use. It is true that it is possible to make up a ration that will be theoretically correct and omit many of the foods mentioned, but results are not likely to be so good. The fact that most successful feeders start with some such simple ration as corn, wheat bran and meat scrap and gradually change to the more complicated ration, fighting against the introduction of new factors at every step, is pretty good proof that it is necessary or at least advantageous to do it. And while the simpler rations may be fed with fairly good results, the largest possible returns per hen and the largest profit on the investment are not secured in that way.

Wet and Dry Mash.

Whether the mash should be fed wet or dry is largely a matter of convenience. There is something of an art about the proper mixing and feeding of wet mash, and some men never learn it. There is not much room to question the statement that when the wet mash is properly fed better results can be secured than in any other way. Under some conditions, however, it is possible to get good results with dry mash, and there are important arguments in its favor, especially when the hens are kept in large flocks. If it is to be fed dry it may usually be kept before the hens all the time, as they are generally in little danger of eating too much and in many

cases are more likely to eat too little. If wet mash is to be fed the question of the proper time to feed it must be considered. It is doubtful if it is possible to show by actual test that one time is better than another if the rest of the feeding is adapted to it. Something depends on the flock and the season. It does not appear to be a good plan to give a heavy feed of mash early in the morning and have the hens standing sluggishly around all forenoon digesting it instead of actively digging in the litter for grain. If not laying well they will likely be injured to some extent by such feeding. In the average flock it is probable that noon or night will give better results, and it is usually more convenient to feed it then.

Sample Rations for Laying Hens.

As a guide to proper feeding the following sample rations have been prepared. They are not intended for blind acceptance, and the careful feeder will modify them from time to time as prices, convenience and season suggest. These rations are based on an estimated average consumption of four ounces daily per hen. Where the fowls have farm range and secure a considerable part of their ration from that source the supplied ration may be decidedly less than this amount, and during the summer months little attention need be given to the nutritive values of the foods supplied.

It would not be fair, however, to pass this phase of the subject without calling attention to the fact that the common farm ration in the summer time, consisting almost wholly of whole grains, is decidedly weak in protein. Fowls will make up a considerable proportion of the needed protein from the bugs, worms and seeds that they are able to find on the range, but they can rarely secure enough to properly balance a ration consisting of corn or corn and wheat exclusively. Such a farm ration is mistaken economy. The hens should have access to a box of dry mash at least; they will secure from this the additional protein needed and do it more economically than on an entire grain ration because of the greater weight of grain which must be consumed to answer the same purpose. From November to April the farm flock should be fed on practically the same basis as the flock of the specialist. At this time the food value of the range is low.

Maintenance Rations.

The average hen that is not laying will do very well on about two and a half ounces of feed as compared with the four ounces which she required when laying, and with a corresponding reduction of total protein from .60 ounce to about .35. No special attention need be given to the ratio of the maintenance ration in practical feeding, but it is worth repeating that a box of dry mash ought to be kept before the hens all the time, whether laying or

not; and if this is done and the daily grain feeding is adjusted to the appetite and condition of the fowls they will take care of the protein problem themselves to a considerable extent. It is true that under some conditions hens will consume more of the dry mash than is good for them. As the mash is usually compounded there can be no objection to consumption of the mash reaching one-third of the total food consumption, or possibly one-half when laying heavily. If it exceeds that proportion it is usually advisable to put a check on it by increasing the proportion of bran or by leaving the mash exposed only part of the day. This is about the only modification that is likely to be needed.

In compounding the following rations the values given in the table on this page are used. Most of these values are taken from Henry's Feeds and Feeding and given to the nearest decimal, which is accurate enough for practical purposes. For the convenience of those who may wish to use the table for general reference the percentage of all nutrients is given, but attention is called to the fact that in the sample rations all factors except protein and fibre are ignored. It is probable that the percentage of fat is as important practically as the percentage of crude fibre, but this subject appears to have been entirely ignored by investigators.

Table of Average Composition of Feeding Stuffs used in Poultry Feeding.

	Protein p. c.	Crude Fibre p. c.	Carbo-hydrates p. c.	Fat p. c.
Corn	10	2	70	5
Corn meal	9	2	69	4
Corn and cob meal	9	7	65	3.5
Gluten feed	24	5	51	10.5
Wheat	12	2	72	2
Bran	15	9	54	4
Middlings	16	5	60	4
Shorts	15	7	57	4.5
Buckwheat	10	9	65	2
Buckwheat bran	12	32	39	3
Buckwheat middlings	29	4	42	7
Oats	12	10	60	5
Barley	12	3	70	2
Rye	11	2	73	1.5
Peas, Canada	24	7	50	1
Kaffir corn	10	1	75	3
Millet	12	10	57	4
Sunflower seed	16	30	21	21
Linseed meal or oil meal, o. p.	33	9	35	8
Linseed meal or oil meal, new pro	33	10	38	3
Peanut meal	48	5	24	8
Green bone	22			17
*Meat scrap	55			30
Dried blood	84			3
Skimmilk (gravity)	3		5	1
Buttermilk	4		4	1
Whey	1		5	1
Clover hay	12	25	38	3
Alfalfa hay	14	25	43	2
Silage	2	6	11	1
Beets, mangel	1	1	6	
Cabbage	2	1	4	

* Meat scrap varies widely in composition; in practical feeding the analysis on the bag must be adopted.

Ration No. 1.

A whole grain ration. Not likely to give as good results as one providing a mash but meeting all the theoretical requirements.

	Protein	Fibre
200 pounds of corn	20	4
200 pounds of wheat	24	4
100 pounds of oats	12	9
60 pounds of meat scrap	33	

Per cent of protein, 15.2; fibre, 4.

Ration No. 2.

A simple formula offering little variety. A little high in fibre.

	Protein	Fibre
200 pounds of corn	20	4
50 pounds of buckwheat (or oats)	5	4.5
150 pounds of mash	36	8

Per cent of protein, 15.2; fibre, 4.

Mash formula: 200 pounds of bran, 150 middlings, 100 meat scrap.

Ration No. 3.

A better ration under most conditions.

	Protein	Fibre
200 pounds of corn	20	4
100 pounds of wheat	12	2
150 pounds of mash	37	9

Per cent of protein, 15.3; fibre, 3.3.

Mash formula: 100 pounds each of bran, middlings, ground oats and meat scrap.

Ration No. 4.

A more complicated ration but better for fowls in confinement.

	Protein	Fibre
200 pounds of corn	20	4
200 pounds of wheat	24	4
50 pounds of oats	6	5
250 pounds of mash	54.7	13.3

Per cent of protein, 15; fibre, 3.5.

Mash formula: 200 pounds of bran, 100 pounds of middlings, 100 pounds of buckwheat middlings, 100 pounds of corn meal, 100 pounds of gluten feed, 50 pounds of meat scrap, and 50 pounds of oil meal. Pounds of protein in 100 pounds of mash, 21.5; fibre, 5.3.

Is It Practical?

The foregoing discussion of feeding should enable any one to feed with a pretty accurate knowledge of what he is doing if he will take the trouble to work out his rations along the lines suggested. Whether he will be any more successful than before depends upon the amount of practical judgment he combines with his figures. Many will doubtless think that all this is too elaborate and the-

oretical for the practical man, but the more practical the poultryman is the more willing he generally is to use all possible aids in his feeding. It would be foolish to rely entirely on food tables and mathematics in working out rations, and it would be just as foolish to shut one's eyes to all that food experts have learned. Undoubtedly some are doing just this and getting good results, but the great majority are getting the worst of results and would be much abler to understand why if they would sit down and work out the real feeding value of the rations they are giving. For example, the man who is feeding his hens whole corn and nothing else would find that his hens, in order to get the .60 of an ounce of protein that they need daily, must eat at least six ounces a day. This is considerably more than the average hen will consume and more than she can digest if fed for a considerable length of time. Average hens get little more protein than is needed solely for maintenance in the proportion in which they will take such a ration. There is no possibility of their producing eggs. The addition of a small amount of animal food in the form of meat scrap, if fresh meat is not obtainable, will make it possible for the hen to get all the protein she needs without eating more than three and one-half to four ounces a day, and such an addition will usually result in a prompt increase in the egg production. On the other hand, the man who reasons that if a little protein is good a good deal better, would learn, if he would carefully work out his feeding values, that his ration is not only unnecessarily expensive but that it is also so low in fibre that his hens are falling far short of the amount necessary to enable them to digest their food properly, as a direct result of which they must suffer sooner or later from digestive disorders, or at least become valueless as producers. It is not entirely safe to assume that the hens know best what they need and the proportion in which they need it. It is desirable and practical to allow them some measure of liberty in choosing what they will eat, but as things go on most farms we can more certainly protect the health of our fowls if we use a little care and forethought in selecting their feed.

Animal Food.

There is excellent reason for believing that animal food of some sort is a necessity in practical feeding, in spite of the fact that some experiments point the other way. Whether the value of animal food is due entirely to the protein it provides, or perhaps in considerable measure to the mineral elements contained, is a subject requiring further investigation. Whatever the reason, the fact remains that animal food in some form is considered indispensable in feeding the commercial flock. No doubt green cut bone or fresh meat is the best possible source of animal food, if for no other reason than that it is the most palatable form in which

animal food may be supplied. The practical difficulties in the way of securing either one of these feedstuffs and keeping in good condition until fed make it out of the question for more than a few to meet the need for animal food in this way. The great majority of poultrymen find commercial meat scrap or beef scrap the most practical and most convenient source of animal food. Meat scrap, which consists of butchering offal cooked, dried and ground, varies greatly in composition and analysis, and a little more than ordinary care should be exercised in its purchase. Meat scrap should carry an analysis of 50 to 60 per cent protein and as little fat as possible. It should not be particularly disagreeable in odor. The best way to test scrap in this respect is to pour boiling water over a small sample. If it smells like fertilizer under this test it should not be used. The practice of buying meat scrap from local dealers in small quantities is a wasteful way of buying. It should always be secured in hundred-pound bags to get the benefit of wholesale prices. It will keep indefinitely if stored in a dry, cool place. If by any chance it should spoil or become mouldy it should be used for fertilizer. Spoiled meat scrap is a dangerous food for poultry, and, in fact, spoiled meat in any form. In buying meat scrap the percentage of fat should be carefully noted. This generally runs as high as 30 per cent, which is probably much higher than is desirable. The dark-brown droppings and other evidences of indigestion that frequently accompany the feeding of meat may be due principally to an excess of fat. Other sources of animal food are blood meal, pork scraps and fresh cooked butchering scraps and may be used when price makes it an object, but are usually quite high in fat. Blood meal, while containing little fat, should be used with a good deal of care as results with it are often unsatisfactory.

Milk.

Milk is sometimes recommended as a substitute for meat, and during the summer time when fowls are on open range it will probably answer very well. It is not a complete substitute for meat, however, when the fowls are closely confined during the winter. In a general way it may be said that there is nothing in any of the rations that have been discussed for which something else cannot be substituted, but to this general rule corn and animal food appear to be exceptions. For the rest, so far as we now know, there is no reason why substitutes should not be made wherever it appears to be desirable to do so. Whatever cheapens the ration or makes it more palatable to the hens is worth feeding freely, provided its use does not materially affect the standards of feeding laid down at the beginning of this chapter.

Green Food.

Fowls on open range consume a considerable amount of green food and in winter or when in confinement should be provided with a regular supply in some form. It is not probable that green food so supplied plays any appreciable part in the nutrition of fowls but undoubtedly they will keep in better health and lay more eggs if it is provided. The tender shoots of sprouting grains, grass and young clover are greatly relished. In the winter cabbage, roots of all kinds, particularly mangels or stock beets, are good. Lacking these clover hay or even silage may be substituted. Mangels, however, are so well adapted to the purpose that a sufficient quantity for winter use should be raised by every one who keeps fowls. Dried beet pulp is used successfully by many, but is more expensive.

Grit and Shell.

Exactly what function is performed by grit is not perfectly understood. There is no good reason for believing that grit is a necessity or that it in any way performs the function of teeth in the preparation of food. Careful experiments have shown that the consumption of grit may be very slight or may be omitted entirely without in any manner affecting the health of the fowls. Lime in some form is necessary to provide shell material. Oyster shell is usually the most convenient source of supply for this purpose, and where oyster shell is regularly supplied grit does not seem to be at all necessary either on open range or in confinement.

CHAPTER IX.

PRODUCTION OF TABLE POULTRY.

With the exception of certain localities, here and there, where highly specialized lines of table poultry production have been developed, the production of high grade table poultry has been completely ignored by farmers. Without any question there is an excellent opportunity for developing a paying business in supplying consumers who want the best in table poultry and are willing to pay much better prices for it than the ordinary range of wholesale prices would indicate. Sales of market poultry would rapidly double if poultry of good quality were generally obtainable. Those who keep flocks of general-purpose fowls are realizing only a part of their possible income by neglecting this branch of the business. Any of the general-purpose or meat breeds may be used for this purpose, as the chief secret in the production of high-class table poultry lies in the proper feeding of the fowls before they are sent to market. It is of course desirable that pure-bred fowls should be used for the sake of greater uniformity in size and appearance. Plymouth Rocks and Wyandottes have no equals in this respect in most of our markets. They have plump bodies and in an unusual degree the yellow legs and skin which are most popular.

In the production of the best table poultry the fowls are handled with reference to their final market almost from the start. They are so managed and fed that they have little occasion or disposition to take much exercise, and in this way their flesh is kept comparatively soft until the fowls are pretty well grown and ready for final fitting. When they have reached a weight of three to five pounds they are usually in the best condition for fattening, and unless there is something special in the state of the market to prevent they are fattened at this time and either disposed of for immediate use or for storage. There are two general methods of fattening fowls, known as pen fattening and crate fattening.

Pen Fattening.

In pen fattening fowls in flocks of convenient size are confined to small house pens, crowding them so as to prevent exercise. They are fed the usual fattening rations in troughs. Fattening can be done in this way at the lowest cost for labor and equipment, and for ordinary market purposes it is most practical. Fowls fattened in pens, however, do not represent the highest quality or largest

gains obtainable as there is too much opportunity for exercise and the flesh cannot be softened as in crates.

Crate Fattening.

For crate fattening, crates are provided similar to the one shown in Fig 24, which is 6 feet long, 20 inches deep and 20 inches high. This crate is divided into three compartments accommodating from three to five fowls, depending upon size. The bottom of this crate is slatted or covered with heavy inch-mesh netting, and the fowls are confined in them for from two to four weeks. Under such confinement, with no opportunity whatever for exercise, the muscle fibers become quite a little softer and with the proper rations excellent quality is secured. Whether the fowls are fed in pens or in crates the rations used by the best fatteners are very similar, consisting of fine-ground grains mixed with buttermilk to a batter consistency and fed two or three times a day. Experiments have shown that there is little use in trying to fatten fowls beyond a certain point on whole grains, and the best results are always secured with the fine-ground grain mixtures and buttermilk.

The ration in most common use in the Western fattening stations, where this method has been remarkably developed in the last few years, consists of about 60 pounds of corn meal and 40 pounds of low-grade flour. About 1½ pounds of buttermilk is required to each pound of grain. Some feeders use oatmeal instead of low-grade flour, or in addition to it, and other foods are used to some extent. A fattening ration of 60 parts of corn meal, 30 parts of low-grade flour and 10 parts of wheat middlings or oatmeal would probably prove a little more palatable to the fowls, as the mixture of corn meal and low-grade flour alone is sometimes too slimy to be entirely palatable. Fowls fed in this way are known on the market as "milk-fed" and command the highest prices when marketed in good condition. Fowls so fed, however, spoil more quickly than those which are fattened without milk and care must be taken in their handling on this account. The poultry man who contemplates making a specialty of high-grade fowls for market has to face the necessity of sending them to market dressed, because it is not practicable to ship specially fatted fowls alive, nor is it possible to get satisfactory prices for them when so shipped.

Dry Picking.

A still more discouraging thing to the beginner is the necessity for sending the chickens dry-picked. In nearly all instances the best markets demand dry-picking, not only on account of appearance but also because the fowls keep in better con-

dition. The average poultryman who does not live near a city has little chance to learn dry-picking as it is practiced by experts. His first attempts at self-help are seldom reassuring. The expert finds it a simple matter. A couple of quick cuts with the knife, a shudder and a few convulsive struggles, a few quick motions of the hands and it is all over and the feathers in the box. There is only one way for the beginner to learn and that is to get the best possible instruction and then keep practicing until he has mastered the art.

In dry-picking the expert first makes a cut in the back part of the mouth which severs the large blood-vessels lying on each side of the neck, and then the bird is "stuck" by running the point of the knife into the brain, touching the skull between and just back of the eyes. When properly done the fowl immediately becomes insensible, the muscles which control the feathers relax, the feathers loosen and for a minute or two can be removed with the greatest ease. Getting the proper stick is a matter of practice, as is also the removal of the feathers before the muscles begin to set again and tighten their hold on the feathers. In the Boston market a somewhat different method is followed. Here most of the bleeding is done with an outside cut, running the knife through the neck back of the ears, between the windpipe and the spinal column and making a cross cut against the latter that severs both blood-vessels. This method is supposed to make the fowl bleed better. Sticking is done by inserting the point of the knife from the outside just in front of or under the eye and forcing it up into the skull, reaching the same point as in the inside stick.

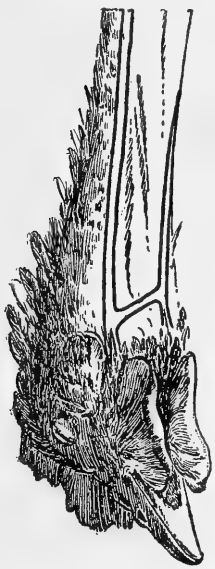


Figure 25—Showing Large Blood Vessels

There are other methods of killing fowls for dry-picking, but these two are the ones most commonly used. They are both tolerably difficult for the beginner to acquire, and even experts find some difficulty in employing these methods when they are out of practice. It is questionable, therefore, whether the farmer or the poultryman with a small flock can satisfactorily use them.

A Simple Dry-Picking Method.

Another method, which is simpler and which requires practically no skill in applying, is that of clubbing the fowls. In dry picking by this method the fowl is hung up by the feet so that its head will be about even with the waistline of the picker. A cord with a slipnoose may be used but a more convenient arrange-

ment is to have the cord terminate in a wooden button about an inch to an inch and a quarter in diameter. In using, the cord is wrapped once round the fowl's legs, and the button slipped through between cord and legs. So fastened the fowl will be held securely no matter how hard it struggles but can be released instantly when the picker so desires. Holding the fowl under the left arm it is given a sharp blow on the back of the head, using a club of convenient size and weight. A hammer or hatchet handle does nicely. After striking with the club the knife is inserted into the mouth and the bird bled in the usual way, the blood cup attached by a hook which runs through the lower mandible, and the picking proceeds as rapidly as possible. This method does not loosen the feathers as completely as is done in sticking when properly done, but it never fails to give fairly good results and the beginner is not annoyed by frequent failure to get a good stick, which makes it impossible to pick the fowls at all without scalding.

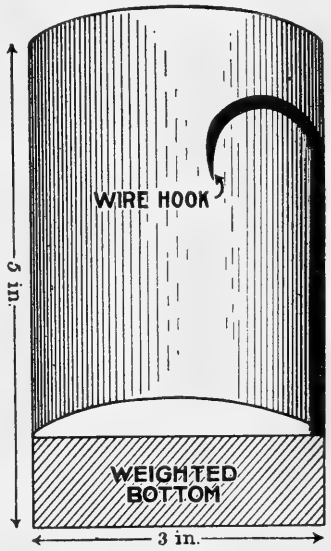


Figure 26—Blood Cup

The requirements of the market should be carefully studied before sending fowls to it and the fowls dressed according to its particular demands. Philadelphia and Boston prefer fowls undrawn with head and feet on, and without any question, if the fowls have been properly prepared by starving for 24 hours or more, this is much the better way to send them to market. Undrawn fowls keep better than drawn fowls and customers should be encouraged to purchase them in this condition.

The farm poultryman who does not have a large number of fowls to dispose of will find it more to his interest to secure a retail trade or to make a contract with some retail grocer or butcher to handle his fowls for him, as much better terms can be made in this way than by trying to sell them at wholesale. Carefully dressed and put on the market clean and in neat packages the price which may be secured for such fowls is very much in advance of the price paid for ordinary market stock.

Scalding Fowls.

Where the market does not demand dry picking the poultryman or farmer will have less difficulty in putting his table poultry on

the market in an acceptable manner. While scalded poultry never looks as well as dry picked there are some markets which prefer it dressed in this way, and with reasonable care fowls so dressed will make a much better appearance than is usually the case. The chief reason for the blotched and discolored appearance of scalded fowls is due to the unnecessary breaking of the skin in dressing. If the fowls are to be marketed with their heads and feet on they should be hung up by the feet, killed by clubbing and bled in the way which we have already described in connection with the directions for dry picking. Killing by chopping off the head is always objectionable on account of the fluttering and bruising of the wings which always accompanies this method. As soon as the fowl is through bleeding it should be scalded at once. In scalding, boiling water should not be used but at scalding temperature only, which is 180 degrees. Plenty of water should be used for the purpose and on the farm there is probably no better way of doing it than to use the common iron kettle which should be about two-thirds full of water. Plenty of water must be used so that the fowls can be completely immersed. Heat the water to the boiling point and then pour in from one to two gallons of cold water to reduce it to scalding temperature. Hold the fowl firmly by head and feet and dip it completely under the water and withdraw as quickly as possible. Now hold it head down and shake it to loosen the feathers, then dip a second time. Usually two dippings will be sufficient to loosen the feathers. The fowl should be hung up by the feet as when being bled, and picked promptly without touching the skin. Most of the blemishes on scalded poultry are due to pinching and rubbing the skin, which may be avoided with a little care. After the fowl is plucked it should be cooled promptly and should not be handled until thoroughly cooled. If the fowl is drawn it should be allowed to cool before drawing and should be thoroughly dry when handled. If these precautions are taken the skin will not be marred and the fowl will make a much better appearance in the market. Dressed fowls should be wrapped in wax paper when marketed. This paper can be secured at a low price and the more attractive appearance made by poultry so wrapped adds decidedly to its salability.

This subject has been discussed from the standpoint of mature fowls or roasters altogether, because in most instances this is the most profitable way in which to dispose of surplus stock. Chicks that are hatched early in the season may sell profitably as broilers, but the great majority of farm-raised poultry is hatched too late to command good prices as such, and when this is the case it is a waste of opportunity to neglect their proper preparation to sell as roasters.

In what is known as the South Shore District, near Boston, the production of what are known locally as soft roasters has

become an important industry and there many farmers depend upon their sales of soft roasters for the greater part of their income. The soft roaster business is a highly specialized industry, and most farmers will not be interested in developing it along the lines followed in the South Shore District. Every young chicken, however, is a soft roaster if it is properly handled, fattened and killed before reaching maturity, and there is a large and entirely unsatisfied demand for such fowls in every market. It will amply repay anyone to make the production of table poultry an important part of his business at any season of the year. Even those who are not interested in the production of market poultry as a specialty should at least put their surplus stock on the market in good condition.

CHAPTER X.

THE HEALTH OF THE FLOCK.

The losses from disease in the poultry yard are much heavier under ordinary conditions than in other classes of livestock, due in large measure to the artificial conditions under which our fowls are kept and the extreme methods adopted by many in poultry management. There is little use in doctoring sick fowls, as the value of the birds is too small to pay for the time required in treating them. Rational methods of feeding and management, careful breeding and sanitation will do much to prevent the appearance of disease. The use of fowls that are low in vigor is one of the most common sources of disease and loss.

An important point in the prevention of disease therefore is the use of nothing but the best and most vigorous fowls in the breeding pen. Many evidences of low constitutional vigor are apparent to the observant poultryman and it is only necessary to give serious attention to this matter to improve the general health of the flock. The housing and feeding of the stock are of the greatest importance in protecting health. Houses that are well ventilated, that are dry and clean, and that are thoroughly disinfected at least once a year are essential. It is not desirable to have warm houses, particularly for breeding stock, and it is much safer to err on the side of having them too cold rather than too warm. Neither should the fowls be confined to their houses any more than is absolutely necessary. The widest possible range under the most favorable conditions should be given the breeding stock, even though the rest of the fowls may have to be confined.

Irregular and improper feeding of fowls is a prolific source of disease. Experiments, both with poultry and with other classes of livestock, indicate that the use of a certain amount of corn in the ration is accompanied usually with vigorous fertility and vitality. The condition of the fowls, however, has much to do with this matter, and obviously breeding stock that becomes overfat on a heavy corn diet is less likely to give good results than stock in better breeding condition. Where corn is freely used care should be taken to see that the fowls take plenty of exercise, feeding grain in deep litter and compelling them to scratch for practically all grain given. Injurious feedstuffs, or those which have been spoiled or damaged, frequently cause disease and only the best and most wholesome grains should be used in feeding.

Soil Contamination.

The soil is subject to contamination through the presence of a considerable variety of disease germs, and many poultry farms have been seriously handicapped or ruined in this way. The danger is most common in heavy clay soils and in damp locations. With ordinary care and management sandy and gravelly soils are less seriously affected. There is no reason why fowls cannot be kept on heavy soils in safety but more care must be taken to keep the surroundings clean and well drained, and whenever possible it is well to give the permanent quarters an occasional rest by temporarily transferring the fowls to some other location and allowing something to grow on the ground. Yards should be cultivated and sown to rye or grass when they become bare, at which time also they should be treated with liberal applications of air-slaked lime. The observance of these simple precautions will assist greatly in keeping down bacterial diseases.

The poultry house should be disinfected occasionally, for which purpose a variety of disinfectants may be used, giving preference of course to those which are most readily available. The orchardist will find the lime-sulphur wash satisfactory; the stockman will get as good results with the common sheep dips or other coal tar disinfectants which are used in general disinfection; and in the absence of anything else ordinary whitewash answers the purpose of the latter. The tendency to scale and rub off makes it less desirable for the purpose than the other preparations mentioned.

Dissecting.

The importance of dissecting dead chickens is not realized generally and the subject needs emphasis. If poultrymen would form the habit of cutting up their dead chickens, examining the various vital organs and learning to recognize the normal appearance of the organs and their appearance when diseased, it would assist greatly in protecting the health of the flock. The ability to recognize the cause and location of disease in fowls is an invaluable asset to the poultryman. The most convenient method of dissection is to lay the bird on a board or a table, breast up, fasten the wings and feet in an outstretched position by driving nails or tacks through them, then split the skin from neck to vent and remove the breast bone and attached muscles. This will lay bare the entire body cavity and make easy the removal of the different organs and their examination. In all cases of uncertainty in regard to the cause of death this method should be followed.

Some Common Diseases.

It is not the purpose of this chapter to go into a general discussion of the different diseases of poultry, but a few of the more common are mentioned and such simple treatments indicated as are practicable under ordinary conditions. Fowls that have been seriously sick should never be returned to the breeding pen no matter how valuable they may have been before sickness, as there is no more certain way of undermining the health of the flock than by using such fowls, even though they may seem afterward to have entirely recovered their health. The value of a sick bird that has been cured is simply its value on the market and it should never be thought of in any other way.

The two general classes of disease in mature fowls that prove most troublesome are digestive disorders and those of the nature of catarrh or roup. Digestive disorders are usually due to improper feeding caused by using extreme formulas or methods, by supplying feedstuffs that have become spoiled, or by a lack of certain things which are essential to the health of the fowl. A lack of green feed, for example, may result in liver disorders. Rations which contain an excess of fat will also cause similar disorders. Death from liver disease is easily distinguished by examination. The liver may be mottled with lighter colored tissue or it may be much darker than normal. It may be greatly enlarged and congested, or it may be wasted away. In young chicks the liver may be edged with red while the central part is yellowish in color. The gall bladder may be enlarged and the liver, where it comes in contact with it, blackened. Several liver diseases are indicated by these symptons, but as practically all are traceable to improper food or methods of feeding they need not be discussed in detail. Unfortunately the presence of liver trouble is rarely accompanied by external indications until it has progressed so far that treatment is of little avail. The careful and observant poultryman, however, may often save fowls by detecting liver disorder in early stages and administering a dose of one-fourth to one-third teaspoon of Epsom salts, than which there is no more simple effective remedy for any digestive or liver disorder.

Acute diarrhoea and inflammation of the intestines are easily recognized and taken in the first stages are best treated with Epsom salts, as is also the case with inflammation of the crop or of the glandular stomach, commonly called gastritis. These latter troubles are due to the feeding of irritating or poisonous foods. Most cases of so-called cholera are simply cases of acute indigestion. Genuine cholera is a very uncommon disease and one which there is little hope of treating when it does make its appearance. On account of the comparative infrequency of its occurrence, how-

ever, it is usually safe to assume that deaths result from some other cause.

Fowls are subject to the attacks of a variety of intestinal worms, but they are all more or less amenable to the same treatment. Where worms are suspected the proper treatment is a dose of ten grains of areca nut given after fasting, in a teaspoonful of warm milk. In all cases of internal disorders special care should be taken with the ration, giving the fowls whole grains in limited quantities, plenty of green food and open range. No matter what symptoms may be observed it is always a safe precaution to remove sick fowls from the flock, and every poultry plant should have a small house which may be utilized as a hospital.

Diseases of a catarrhal nature, whether they are simple colds or the much-dreaded roup, usually start with cold or inflammation of the mucous membrane of the nostrils and head, and there will seldom be much trouble or loss if the fowls are isolated from the flock as soon as the initial stages of the disorder are observed and given simple treatment. The exact nature of roup is not perfectly understood, but there is good reason for believing that there would be few cases of roup if colds and catarrh were taken in hand promptly at their first appearance, when they may easily be cured. There is no rational objection to the use of fowls, in breeding flocks, that have had simple colds, but when the cold has advanced to the stage of roup such birds should be disposed of at once. The best treatment for a simple cold or catarrhal condition is thoroughly to wash out the nasal passages with a two per cent solution of boric acid or with peroxide of hydrogen or a strong solution of potassium permanganate. For this purpose the most effective instrument is a simple rubber syringe, which can be procured at any drug-store for a few cents and ought to be a regular part of the equipment of every one who keeps chickens. Frequently two or three treatments of this nature will be all that is necessary to effectually check this disorder.

A somewhat simpler treatment, and one which is perhaps as effective when the disease is treated in its first stages, is the use of lamp oil. This may be applied to the nostrils of the fowl with a feather or a swab, but a better plan is to fill a quart can two-thirds full of water, pour on two or three spoonfuls of kerosene and then slowly dip the fowl's head deep into the can, and repeat the operation two or three times with short intervals between. This results in spreading a thin film of kerosene over the nasal membranes, and one or two applications will frequently cure. Where potassium permanganate is used the fowl's head may be dipped in a strong solution in the manner just described

for the use of kerosene. Chronic cases of catarrh and even roup may be cured by persistent use of the means already described, but much time and patience are required.

Diseases of Chicks.

The diseases affecting young chickens are numerous, some of them directly traceable to defective breeding stock or improper hatching, and some to the conditions of brooding and feeding during the first two or three weeks of their lives. As in the case of mature fowls the poultryman should thoroughly familiarize himself with the appearance of the organs in normal condition, and then dissect his dead chickens until he has in this way determined certainly the nature of the disorder. There are half a dozen general causes of disease in very young chickens, all of them accompanied by similar symptoms, and not even those who are expert in the diagnosis of chick diseases are able to identify such diseases by outward symptoms.

A great deal of misunderstanding is due to the common habit of referring to practically all diseases of chicks as "white diarrhoea." There is no such disease, properly so called. Anything that affects the health of the chick will cause diarrhoea, and chick diarrhoea is usually white. Dissection and microscopical examination are often necessary in order to certainly determine the cause of the disorder. A common disease in some sections is that known as baciliary white diarrhoea. This disease has been thoroughly investigated and described by the Connecticut State Agricultural Experiment Station at Storrs. A complete description of the disease, of its symptoms and of the methods of prevention will be found in Bulletins Nos. 60 and 68, which can be secured by addressing the Station at Storrs. Another disease, known as coccidiosis, is described by Dr. G. B. Morse in Circular 128, Bureau of Animal Industry, Washington, D. C. This circular fully describes the symptoms and gives detailed methods for detecting the presence of the disease, and it should be in the hands of every poultryman.

Another disease, perhaps as common as either of the two mentioned, is aspergillosis. This is caused by mould which grows in the lung tissue of the young chick and is easily detected on examination, the lungs of infected chicks being more or less filled with white nodules or balls of yellow cheesy matter. The usual cause of aspergillosis is the use of mouldy food, or mouldy litter in the brooder. Dusty clover hay is a prolific source of aspergillosis and every precaution should be taken to protect the chicks from mould of every sort during the first few days of their lives.

Congestion of the lungs, sometimes called brooder pneumonia, is a common disease among young chickens and is easily de-

tected by the appearance of the lungs, which instead of being light pink in color are dark and filled with bloody mucus or frothy matter and indicating congestion quite plainly. This disease is common among chicks brooded in cold or "lampless" brooders; it is caused by over-heating or chilling and can be carefuly guarded against in the management of the brooder.

Acute diarrhoea, due to the feeding of mouldy, sour or irritating foods, is common and is sometimes mistaken for some of the various forms of disease already described. It is hardly possible to lay down specific rules for the prevention of such disorders, but careful and conservative feeding will always prevent the appearance of the trouble in vigorous chicks.

Much may be done to relieve chicks with a tendency to bowel trouble by the addition of a small amount of Cayenne pepper or ground mustard to the soft food, never using enough to make it disagreeable to the taste. Diarrhoea may frequently be checked by giving boiled milk to drink. Boiled rice fed once or twice a day is excellent. Various astringent drugs are recommended, but if the simple agencies just described do not stop the trouble it is doubtful whether there is anything to be gained by more radical treatment.

Gapes.

Gapes is caused by the presence of a worm in the throat of the chick and the source of infection is the soil. The gapeworm does not cause any serious injury to the young chick directly, and without question many thousands of chickens have gapes without that fact ever being noted, as there is no way to detect presence of gapeworms unless in numbers sufficient to obstruct the passage of air and in that way cause death by suffocation. Clay and limestone soils are particularly favorable to gape infection and frequently there is no way to prevent the disease except by keeping the chicks on board floors till they are past the danger point, which is about the fourth or fifth week. The only other alternative is to have two or three nursery yards on which the chicks may be raised in alternate years and in that way escape contamination of the soil.

The usual source of infection is from earth-worms which carry the eggs of the gapeworm to the chick. The eggs probably hatch in the intestinal tract and the worm in minute form burrows its way through the body tissues until it reaches the windpipe, to the inner surface of which it attaches itself and remains there until it is dislodged or until it has matured. At maturity, which is most commonly about the time the young chick dies, the female gapeworm contains hundreds of fertile eggs, at which time it also dies. As the body tissues decay the eggs are set free and enter

the soil. Obviously earth-worms do not cause gapes; they simply carry the infection, and if there is no infection in the soil earth-worms are entirely harmless.

The chief cause of leg weakness is insufficient exercise or too close confinement to house pens. It can usually be remedied promptly by allowing the chick access to an outdoor run.

"Common Sense Treatment of Farm Animals"

By DR. C. D. SMEAD

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