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THE BUSINESS HEN

Breeding and Feeding
POULTRY FOR PROFIT

BY

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Managing Editor of The Rural New Yorker

WITH SPECIAL ARTICLES BY

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AND OTHERS

NEW YORK
THE RURAL PUBLISHING COMPANY
TIMES BUILDING

SF 487

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49959

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ELECTROTYPED AND PRINTED BY

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I LOVE THE HEN.

There's lots of folks that love a horse
About as well as they know how.
We ain't all built alike—of course ;
There's them that do just love a cow
Above their wives. Some folks will sleep
When cows or horses have the talk ;
But start a word edgeways on sheep,
And see the way their tongues will walk.
And some folks sit up half the night
To sing the virtues of the hog ;
And I know folks uncommon bright
Who rub their love thick on a dog.
I have, as now I must rejoice,
No quarrel with my fellow-men—
But of all animals my choice
Forever is the laying hen.
She ain't so big or yet so stout
As hog, or horse, or sheep, or cow.
And yet she knows what she's about.
She pays her bill—that suits me, now.
So let them brag up all their stock
And satisfy themselves ; but, then,
My mind is made up like a rock—
You can't fool *me*, I love the hen !

PREFACE.

DURING the past ten years some 5,000 questions regarding poultry and its management have been asked by readers of *The Rural New-Yorker*.

In preparing this little volume I have had these questions in mind. They are all answered in the following pages. Most poultry books have two faults. They are generally prepared by one man alone, and too much space is usually given to a discussion of the merits and markings of the different breeds. In preparing this volume I have endeavored to secure the opinions of the best-informed poultry-men in the country. I desire to express my special indebtedness to Messrs. P. H. Jacobs, Henry Hales, James Rankin and J. H. Drevenstedt for advice and information. Men who keep "The Business Hen" care more for performance than for outward appearance. All who are interested in poultry have now excellent opportunities of studying the different breeds at exhibitions. For these reasons I have given but little space to breeds and their characteristics.

There is also nothing said about geese and other fowls and pets. This book deals with the hen alone. I prefer to treat other poultry exhaustively, or not at all. Much is said here about the Leghorn hen. This is simply because the Leghorn happens to be doing the work on the majority of the successful egg farms that I have examined. Special attention is called to the chapters descriptive of Mr. Wyckoff's hens and Mr. Johnson's farm. These men are good models for would-be poultry-farmers to follow.

H. W. COLLINGWOOD.

THE ORIGIN OF POULTRY BREEDS.

CHAPTER I.

HENRY HALES.

A KNOWLEDGE of the best methods of breeding and rearing poultry and the origin of the various breeds, as well as of the processes by which they were formed, can be acquired only by deeper study than most people imagine. It is not many years since earnest attention was first given to this improvement or production, by careful selection, of the various forms and colors that distinguish the different varieties of the poultry of to-day. Still, at a very early period some attention was, no doubt, given to fowls by man, probably by merely keeping the most attractive-looking and destroying the poorest, and in this way a few defined breeds were distinguished in a crude way, as Chinese, Game and all its varieties in India; and Dorking, Hamburgs, Polish, French and Spanish in Europe. It would take a long chapter to describe all the old types of these breeds, but from what we can remember of them, or see in many old portraits, or learn from ancient descriptions, the present breeds are in strong contrast to their bygone prototypes. I do not mean that all the "improvements" are of practical value, for nature has her own inviolable laws of compensation, and does not allow all the good qualities and beauties to be centered in a single breed; so we find that each has its special merits and demerits, and the more varieties we have, the more their characteristics vary. In this lies the charm for the fancier; he observes with admiration and pride certain results from selection and careful breeding; but, lest he should become too conceited, nature sets a limit to the possibilities of his work.

In studying nature, especially in the care of birds, we find that some species vary naturally, even in a wild state, while others vary but very little, either in size, form or color, even in domestication. This is noticeable in guinea-fowls and peafowls, and to a less extent in turkeys, geese and ducks, but pigeons and gallinaceous fowls have a variable nature that sports into oddities, not only in form, but also in color and size. This characteristic may be taken advantage of, and under the hands of man these birds are plastic to a singular degree.

Long and interesting accounts of the origin of our domestic fowls may be found in Darwin's "Animals and Plants Under Domestication." The more knowledge brought to bear on this subject, the stronger the evidence that the progenitors of all our domestic fowls were of one species—*Gallus Bankiva*. All the varieties of pigeons, which are very numerous, are now believed to have a common origin, and the more I study the subject, the more I feel convinced that this is also true of our domestic fowls. In breeds that resemble *Gallus Bankiva*—as the Games, and in color the Brown Leghorns—who has not noticed a wilder character than is observable in other breeds further removed from the original type in form or color? Games and Dorkings are both primeval in form or color, although the Silver-Gray Dorkings do not, at first sight, appear so much so in color as the others. Breeders of Games, however, know that it is an easy step from the Black-breasted Red to the Duck-wing colors, and this is the case with the Dorkings also. The pugnacious character of the males, the quality of the meat of both, and the intelligence of the Dorkings are quite noticeable. The tendency to brassiness in white and gray feathering, and the persistent intrusion of red and yellow in promiscuous breeding point in the same direction. When abnormal peculiarities are transmitted by selection, and divergence from the original type is established, the greater is the change from the original characteristics. The eggs also show this change from normal conditions, in size, shape, etc. From the creamy or nearly white, we have various shades of buff,

pinkish and pure white. Moreover, they are more or less pointed, as well as larger or smaller than the original.

But nothing shows the unity of descent of our domestic fowls more than the voice. The *Gallus Bankiva* crows in its natural state, although the closing note is said to be a little shorter than the others. We find that fowls from all parts of the world, however long they may have been dispersed, have the same notes, varying only in degree, in accordance with their size, shape and condition. Of the many sounds made by fowls, the first mention I know of is by Gilbert White, in his "History of Selborne," where he records some of them and their modulations. We find they are the same in all the breeds; but more frequent in the lively ones. The language of fowls is more expressive than that of any other animals, as far as we know, ranking next to that of man. From chickenhood, fowls use at least 19 distinct expressive notes or calls, some almost sentences, varied in modulations and embracing a great diversity of meaning.

Regarding the pliability of the nature of fowls, nothing illustrates it more than the production of Bantams. Not many years ago these were thought by many to be a distinct species, and were called African, Java or Japanese Bantams. At the present time our fanciers have reduced many other breeds to the Bantam size, though of very different types, and exceedingly small and beautiful. Another charm of poultry-breeding is the production of new breeds, while some older ones disappear.

GOOD AND BAD QUALITIES OF BREEDS.

CHAPTER II.

THE SHORTCOMINGS OF BREEDS.

HENRY HALES.

SO MUCH is said on the wonderful properties of this breed by one person, and on the perfection of that breed by another, that it is well to take a retrospective glance at the several varieties of poultry, and give a few of their shortcomings (I cannot call them failings) as well as of their merits.

Let us commence with the old Games, as they are the nearest in type to the original progenitors of our domestic poultry. Although fine-flavored for the table, doing their own hatching, excellent mothers, and beautiful in shape and plumage, their eggs are rather small; they themselves are not the best of layers, and are not easy to raise in large flocks for the market. They are valued more for beauty or for their fighting qualities than for the profit to be got from them for eggs or the table. Some of our next earliest-known breeds are the Polish, for they appeared centuries ago. They are very beautiful, but their top-knots are a decided objection on a farm or wherever else enemies of any kind can reach them, as they can not see well enough around these tufts to escape, like most other fowls; besides this short-coming their flesh is poor. As chicks, too, they are not very easily raised.

The Hamburgs rival any breed for lovely forms, and exquisite colors and pencilings. Moreover, they are excellent layers,

but, like the last, they are non-sitters ; the eggs, as well as the birds, are quite small ; the flesh is of poor quality, the skins and legs are dark. As in the case of the previous breed, there are several varieties of the Dorkings. Although they are large birds and the finest of table fowls, besides being very fair layers, doing their own hatching and being good mothers, they are not very hardy in our cold winters, and require plenty of room and warm houses. The old Dominiques are also good table fowls, but moderate layers. Next come the Black Spanish and Minorcas, both excellent layers of very large eggs—very good birds for the south ; but in our northern states they are very tender to the winter's cold. Flesh poor ; skin and legs dark.

Asiatics may be divided into two classes—Cochins and Brahmas. Of these, the Brahmas are probably the better layers. All of them are slow in growing to maturity, and are great eaters. Although they lay well in winter, their eggs are rather small in comparison with the food consumed. They are inveterate sitters and fair table fowls when young. Leghorns are among the most valuable as great layers, but are non-sitters. Rather small in body ; flesh only medium. They require plenty of room and high inclosures, as they are great flyers, especially the Brown. The eggs of this breed are smaller than those of the White. The French breeds are scarcely hardy enough for our climate, except the Houdans, and these are not particularly hardy. They are only moderate layers, although fine table fowls. Crevecœurs and La Flèches, particularly the latter, lay immense eggs, but are entirely too tender for America, at least for the Eastern and Middle states.

The Plymouth Rocks are a cross between Asiatic and Dominique, receiving the latter's color. As both are sitting varieties, the Rocks are also strong sitters. They are pretty good feeders, but lazy layers, and are inclined to be egg-eaters. Wyandottes are bred between a non-sitting variety, the Hamburg, and the Asiatic. This was expected to be a better laying variety, and so it is ; the birds have small double combs,

well adapted to resist frost ; they lay early and are fairly hardy ; but many of the eggs are small, especially the pullets' or first eggs. So, it will be seen, all the best points can not be obtained any better in any one breed of poultry than in any one variety among other kinds of domestic animals. The man who intends to embark in the poultry business should well consider which varieties are best suited to his circumstances.

THE USES OF VARIOUS BREEDS.

P. H. JACOBS.

As our country is diversified in soil and climate, the introduction of new breeds has been productive of great benefit to the poultry interests, enabling a profit to be made where formerly but little interest was manifested. With the advent of the Shanghai, Chittagong, and Brahmapootra came a spirit of rivalry in the production of the largest birds, size taking the preference over quality and merit. Scientific breeders, however, made wonderful improvements in the progeny of the original ancestors ; and as the thoroughbred cattle, sheep and swine of to-day have departed from their ancestral types, so have the domestic birds.

Including all classes of Games, there are several hundred breeds of fowls, but those which are most popular and best known are classed as Asiatic, American, English, French and Spanish. The Asiatics are feathered on the legs ; the Americans are clean-legged ; the English and French are compact (the favorite breeds possessing five toes), and the Spanish are non-sitters. No particular breed possesses all the desirable qualities necessary to perfection. Though excelling in some respects, a breed may be deficient in others. But each is adapted to certain climates, soils, and modes of management. The best breed depends upon the purposes for which it is intended, the distance from market, the quarters, the range, the fences, and the color of its carcass when dressed.

In an examination of the breeds the Asiatic may be divided

into Light Brahmas, Dark Brahmas, Partridge, Buff, White and Black Cochins, and Langshans. The Light and Dark Brahmas differ in appearance only in plumage, though the Lights have been bred more carefully for utility than the Darks. They have stood the test of several decades, and are as great favorites to-day as at any previous period. The advantages possessed by the Brahmas are pea-combs and short wattles, which fit the heads closely and enable the birds to endure exposure without being subjected to frosted combs and wattles—a great advantage in a cold clime. They are also heavily feathered, being protected with short, fluffy down on every portion of the body, while their powers of digestion enable them to consume large quantities of food, and thereby not only to create a sufficiency of animal heat, but also to lay during the cold season under disadvantages that would be fatal to some breeds. Hence many persons, while admitting the Brahmas to be excellent layers, do not approve of their capacity for eating a large amount of food, which, however, is really an excellent and necessary qualification instead of being a cause of objection. As they cannot fly, low fences easily confine them, while they also usually lay dark-colored eggs. The Brahmas, however, are heavily feathered on the legs and to the ends of the outer toes, even the middle toe being covered. This is objectionable where the ground is damp and muddy, often causing the feet to become frozen. Some care is also necessary in feeding them, as they readily become fat, after maturity, and then cease to lay. They seldom begin laying before they are eight months old, but if fed judiciously, they lay well at all seasons. As market fowls their yellow legs and skin, as well as their bodies, render them very attractive, and when crossed upon other breeds they always effect an improvement.

The Cochins differ very little from the Brahmas, so far as hardiness and general market purposes are concerned; but they are more compact in body, and have single combs, yellow legs and skin, are feathered probably even more heavily on the

shanks and toes than the Brahmas, and can be easily kept in confinement. The different varieties of Cochins are alike in nearly all respects but color, the Partridge being extremely beautiful. The Cochins are the best sitters and mothers of all breeds, though their large size is often a disadvantage to them where the eggs used for hatching are thin-shelled.

The Langshan is the latest addition to the Asiatic breeds, and is the only one that has not been changed by the breeders of Europe and America, as it is the same in form and characteristics as when first brought from China. The fowls greatly resemble the Black Cochins, but an observer may notice that the Langshan, though nearly as large as the Cochin, can fly over a high fence, while the Cochin can not leave the ground. The Langshan has white, thin skin, pinkish webs between the toes, legs the color of those of the turkey and long sickle feathers; it lays when from six to seven months old. It is not an attractive market fowl, its dark legs and white skin being objectionable; nevertheless, it excels as a table fowl, and as layers the Langshans are said to be intermediate between the sitters and the non-sitters.

The American breeds are the Plymouth Rocks, Dominiques, Javas and Wyandottes. They are all clean-legged, with yellow shanks and skin. Their popularity is due to their hardiness, medium size, and adaptation to nearly all climates. They combine partially the heavy feathering of the Asiatics, with the long duration of the laying season of the non-sitters. They are not only easily kept in confinement, but also make excellent foragers when running at large. They lay eggs darker in color than those of some breeds, which, added to their early maturity, considering their size, is one of their desirable qualifications. The Dominiques are of small size. The black or mottled color of the Java is not preferred by many, as they are in other respects very similar to the Plymouth Rocks—some classifying them as Black or Mottled Plymouth Rocks, though they are really distinct.

Of the non-sitters, the Houdans (a French breed) are the

largest. and they are excellent table fowls ; but their dark legs are an objection in market, while the crests render them liable to roup in damp weather. The Black Spanish is one of the old-established breeds, and once a favorite ; but breeding close for a white face has taken away their compactness, and injured them in vitality. The Leghorns are the best layers, and are hardy, while the Hamburgs are considered by some as possessing an excellent merit in the rose comb. All the non-sitters lay white eggs, and all mature early and are good flyers. Hence, while they are inveterate layers, and will even lay well in winter if kept warm, they feather quickly when young and are therefore not as easily raised as the larger breeds. Their heavy combs and wattles are not in their favor in winter, while they, like all other breeds, cease laying at certain times, both for the purpose of moulting and recuperation.

The only English breed known to me is the Dorking, which is compact in body, possesses five toes, and makes an excellent market fowl in England, but is not a favorite here. The Houdan holds the same position in France that the Dorking holds in England. Both are fine table fowls ; but, unfortunately, Americans sacrifice all the desirable table qualities for the golden skin and legs, though the best breeds for the table have, like the turkey, white skin and dark legs. It may be also stated that the muscles of the breast are increased by exercise, and it should not surprise those who make a specialty of Brahmas and other large breeds for market to be told that the birds that fly the highest have the most breast meat. The Crevecœur, La Flèche and other French breeds have not proved hardy in this country.

The Minorcas, which, it is claimed are, the best layers of all, even excelling the Leghorns, may be mentioned as being of the same size as the Black Spanish, but more compact. There are three varieties—Black, White and Red. They are non-sitters and of fair size for that class, and are also considered hardy ; they are likely to become favorites. The Games are not considered fully up to the average as layers, but in pro-

portion to weight they possess less offal and more breast meat than any other breed, and stand at the head of the list for the table. Crossed on large Asiatic hens, the Game produces the finest of market poultry, while the largest and choicest capons are the result of a Dorking cock and Asiatic hen.

The breeds best adapted to the northwest, where the temperature gets below zero and there remains, are the Brahmas and Cochins, the former being perhaps the better layers and the latter more suitable for hatching young turkeys and ducks; but where there are good markets for poultry and eggs, the Wyandottes and the Plymouth Rocks are excellent if they can have outdoor exercise. The Asiatics, if not fed too heavily, can be kept under shelter with contentment; but other breeds are liable to vices of feather-pulling if confined too closely. The Asiatics may be used for crossing upon the common breeds; but the crossing should be continued till the stock is three-fourths Asiatic, and the last cross should be Brahma, in order to secure the small pea-comb as a protection against severe cold.

In the east, or where the winters are not as severe as in the northwest, the American or Spanish breeds may be used, while the Asiatics would not be out of place. On wet soils avoid feathered legs. Where there is much rain in spring, crested breeds often suffer. There are but few breeds that can not be adapted to the Eastern and Middle states; a warm, dry poultry-house compensating for many disadvantages.

The best breeds for the Southern states are the Leghorns for eggs, and the Plymouth Rocks and Wyandottes for market; as the winters are mild, and these breeds, being active, have a longer season for foraging. But, where one is not partial to the keeping of breeds in their purity, many advantages may be secured by crossing, provided pure-bred males only are used for that purpose. Any of the breeds may be kept in any section, if properly managed, there being greater distinction between those kept under confinement and those roaming at large than between those raised in different climates,

SOME NEWER BREEDS.

The Orpingtons are a cross between the Langshan and Minorca. They resemble the Black Java in color, comb and general characteristics. The color of the bottoms of the feet are pink instead of yellow as in the case of the Java. Anconas are mottled black and white somewhat like Houdans, but with comb and ear-lobes somewhat like Minorcas. The hens, it is claimed, are non-sitters. The Red Caps are fine layers, but carry such enormous combs as to be objectionable to many. The Indian Games are said to equal the Dorkings for table qualities and to be without a rival for crossing on common stock where broilers or table birds are wanted. The hens are more than fair layers. The Sherwoods result from a cross between the Brahma and White Game. They are large white birds with light leg-feathering and small single combs. The hens are good layers. "Sports" of Langshans, Leghorns, Cochins, Wyandottes and other breeds are constantly appearing—an odd color being the chief distinction of the "new breed." With these "sports" and the details of color and markings this book has nothing to do. These "sports" do not, we believe, show any superiority in meat or egg production, and these two items are what we are mainly interested in.

THE EGG.

CHAPTER III.

WHAT IS AN EGG?

P. H. JACOBS.

THE egg is the storehouse in which is deposited not only the germ of the future chick, but also of the elements that serve as food during the growth of the chick until it breaks forth complete in form as a living creature. All creatures of the animal kind are hatched from eggs, not excepting man himself. The embryo animal is gradually nourished from its conception until birth—the necessary warmth, moisture and food being imparted to it by degrees, the period of time necessary for its growth, with some animals, extending over a year's duration; but the hen stores within the shell of an egg certain elements which are connected by heat into many compounds within a brief space of time, and which finally result in the production of a living creature complete in all respects.

An animal is hatched within the body of its dam; but the chick may be hatched outside of the body by its dam, by some other bird, or even by artificial process. The incubation of the chick is similar to the germination and growth of the seeds of plants—heat and moisture being the agencies. The egg must therefore contain every element that enters into the composition of the chick. The hen, in being compelled to hatch her young outside of her body, is imposed with an arduous duty. Within the brief period of twenty-four hours she not only provides the necessary elements that are converted

into bone, flesh, blood, feathers, etc., as well as the carbonaceous matter which also serves as food, but she must derive from some source a large proportion of lime, with which she incloses the substances provided by her for the formation of the future chick; and this work is continued daily until her period of rest or renewal arrives, which we term moulting.

What is an egg? If one could separate the constituent elements of an egg, and arrange them for inspection, there would be a variety displayed that but few are aware of. When the shell of an egg of normal size is taken off, and the contents are separated into their several parts, it will be seen that they consist of carbonic acid, pure lime, and water of crystallization. The white (or albumen) contains about 84 per cent. of water, $12\frac{1}{2}$ per cent. of albumen, 1 per cent. of mineral matter, and $2\frac{1}{2}$ per cent. of sugar. In the yolk will be found about 52 per cent. of water, 45 per cent. of oil, and one per cent. each of albumen, coloring matter, and mineral matter. The mineral matter consists of soda, sulphur, potash, magnesia, lime, as well as substances in combination, such as phosphates, common salt, etc., with such gaseous matter as chlorine, oxygen and hydrogen, all in combination. The total estimated amount of the various substances composing an egg, given in round numbers, may be placed at 650 grains of water, 80 grains of albumen, 135 grains of oil or fat, 26 grains of sugar or coloring matter, and 10 grains of mineral matter, not including the shell.

The arrangement of the parts of an egg is familiar to all. The yolk is suspended in the albumen, held and firmly bound to the shell by two strong cords, which permit the yolk to float on the top of the albumen without regard to the position of the egg. The hen is capable of producing eggs that are sterile, as nature has so constructed her that when under certain conditions the food is transferred to the eggs, and hence the male is in no manner necessary to her in that respect, his function being simply to impart life to the egg while it is on its passage along its regular channel. There are certain stages of the

growth of the eggs, and their relative positions, when he influences several of them at a single union with the hen, while at other times his influence does not extend to more than one. At what periods, or stages of progress, he is most serviceable, is as yet not fully understood, but when the hen has completed the storing of the elements that compose the future chick within the shell, with the aid of the male, the egg is endowed with a living principle, and is a thing of life, ready to germinate like a seed, and requiring nearly the same conditions; but, being well supplied with its own moisture, the only essential is *warmth*.

Why is it that some eggs do not hatch, while others contain strong and active chicks? To solve this problem one is compelled to look back beyond the production of the egg itself. An imperfect egg will not produce a perfect chick. The pullet, not fully matured, can not compete with the hen; while the hen, when she has performed her duty until late in the season, is not a vigorous rival of the pullet. It is well known that eggs vary in form, size and shape. The hen that steals her nest hatches chicks from a clutch of eggs that are uniform in every respect, and such hens having their liberty, are usually in full vigor. When eggs are given to a hen for incubation they may have been produced by as many different hens. In a large lot of eggs we find the very small egg of the immature pullet, the large egg of abnormal size and irregular shape, from the fat hen, the egg with thin shell (which indicates a lack of mineral matter within the egg), and the egg with protuberances, or that is shapeless. One who has ever looked over an array of several hundred eggs in an incubator is aware of the great discrepancies existing between eggs, no two of them being exactly alike. The condition of the hens, their vigor, the lack of the essential elements, the impotency of the male, and other means, combine to cause failure. When the hen lays an egg perfect in shape, of normal size and with the shell free from defects of any kind, such an egg will produce an active, strong chick if the male is in full vigor. The maxim for

guidance should be, "Only a perfect egg produces the perfect chick"; and when care is used in selecting the eggs there will be but few failures in hatching.

HOW THE EGG IS PUT TOGETHER.

HENRY STEWART.

An egg is not simply a mass of yolk surrounded by a layer of albumen and inclosed in a shell, but consists of a vitalized germ imbedded in a mass of yellow yolk composed of several layers and surrounded by a tough membrane known as the vitelline membrane, which is shown in the accompanying drawing, the yolk being at 1 and the inclosing membrane at 2. This yolk is the fertile part of the egg and is developed in the ovary. As it descends the oviduct, it becomes inclosed in a thick layer of albumen, consisting of three distinct films, each of a different density (2, 3 and 4 in the figure), and these are deposited around the yolk at three different periods during its descent along the oviduct. This albuminous covering is inclosed in a double lining membrane of a tough, fibrous character, which is the covering of those imperfect eggs known as soft-shelled eggs, and which are without any solid shell. Immediately over this and attached to it is the outer shell, which

consists chiefly of carbonate of lime. This outer shell consists of several layers of fibrous tissue woven together, and its opacity is due to air contained in the meshes of the interlaced fibers. It is porous and admits the passage of air

freely through the tissues. At 6 is shown a spiral albuminous

ligament attached to the vitelline membrane on each side and also to the testaceous membrane or the fibrous inner covering of the egg. This membrane is drawn down at the obtuse end of the egg, forming a space (7) between it and the shell, which is known as the air-space ; and this forms an elastic cushion for the support of the yelk, while the spiral ligaments, called the chalazæ, act as a spring to protect the yelk against injury and support it as it floats in the albuminous layers. The cicatricula, a yellowish white disc, seen in the surface of the yelk of a fertilized egg, and shown at 8, contains the germinal vesicle and is connected by a canal with the center of the yelk, which is formed of white globules, while the rest of the yelk is made up of yellow granulations, designated vitelline globules.

Such being the character of an egg, it is seen to be made up of the most fragile materials, inclosed in a comparatively strong protecting shell, and supported by springs from the jars to which it may naturally be subjected by the movements it may undergo in the nest during incubation. But nature has made no provision for artificial conditions, as transportation by railroads and wagons, and the jars and jolts which occur in such transportation, and as the interior of the egg is balanced in a very delicate manner only to meet natural conditions, it is by no means prepared for those unnatural ones to which it is subjected when eggs are carried hundreds or thousands of miles over railroads, in freight-cars which are jostled and jarred and bumped forcibly in transit ; consequently it is very easy to destroy the vitality of an egg by shaking it ; and I have met farmers who, when forced to dispose of the eggs of costly pure-bred fowls to the stores, killed them by holding them in one hand and jarring it smartly on the palm of the other hand. Such a jar would evidently rupture the spiral ligaments and set the yelk free, or possibly rupture the delicate covering membrane of the yelk, or disturb its several layers and displace the attachment of the germinal vesicle, which is the seat of the vitality of the egg.

I can not conceive how an egg that has been so roughly treated as to have the contents' thus delicately constructed, all mixed up, can be reconstructed by a few days' rest, any more than a person who has been mashed to a jelly in a railroad collision can settle back to his proper condition by being put into a soft, easy bed in a hospital for a few days. Such shaking up and mixing would be fatal to the egg, and must be avoided by preventing any possible injury during transportation. An egg boiled hard will exhibit all the various peculiarities of structure on dissection ; and if it has been mixed up, the injury will be plainly apparent.

FERTILE AND INFERTILE EGGS.

I. K. FELCH.

I am of the opinion that hens will lay fully as many eggs if kept to themselves as if they have the company of cocks. I certainly should not keep penned with surplus stock more than one male to a pen, no matter what number I had, and in producing eggs for the market, if I were keeping hens in flocks of 40 or 50 I should keep no male.

That an infertile egg will keep longer admits of no argument, for an egg not impregnated will come out from under a hen clear, while one that is impregnated, if sat on 48 hours and then taken out, will surely be of bad odor at the end of three weeks. An egg not impregnated may be sat on 12 days and then be used for all cooking purposes equal to the common run of store eggs. Recently I boiled 12 eggs taken out of an incubator, after 12 days incubation. Ten were clean, two showing the germ to have started, with death at an apparent age of two days. The two impregnated eggs, when cut open, had an unpleasant odor and the white was tarnished, while the yelk had a brassy white tinge, and the dead germ was not hardened by boiling. I ate four of the other 10 and they were in appearance and taste as good as those that were kept 12 days in the pantry. The only difference I can see is, that when

an egg that has not been in an incubator is broken, the albumen adheres more closely together and will not run over so large a surface as will that of eggs that have not been subjected to the heat of the incubator.

THE HEN AS A MOTHER.

CHAPTER IV.

INCUBATION BY HENS.

P. H. JACOBS.

INCUBATION on the part of the hen is simply keeping the eggs at a certain temperature—about 103 degrees—but the temperature is affected by the degree of warmth of the hen herself, and also by the number of fertile eggs in the nest. Some hens do not impart as much warmth as others, in which case the period of incubation is extended a few hours, or a day, as a compensation for the lack of warmth during the regular period, which is usually twenty days. If the warmth is amply sufficient, and the eggs all fertile, the chicks will hatch out a day before the period. The hen may hatch out her brood before the day the chicks are due, or a day after, according to the degree of warmth imparted by the hen and from the chicks in the eggs.

A hen may be a persistent sitter, or she may not become broody during a whole season—her condition influencing her desire. As long as her food is so balanced that her body is not emaciated, or contains an undue storage of fat, she will continue to lay, without regard to number of eggs, until her moulting period. If she becomes fat, she is not in a fit condition for laying; but nature prompts her then to become broody in order to utilize the surplus food stored in her body as a support during the period of incubation. As she is partially supplied with fat, she seldom leaves the nest, being satisfied with a small allowance of food, and when she comes off with her

brood she is in a reduced condition. Some breeds, however, being very active, may not become fat, their propensity to forage keeping them in exercise, and they are known as "non-sitters"; but in fact there is no breed that fails to produce sitters, should the hens be fed on food that is not of a variety, or which is unbalanced, the hen herself selecting that which is mostly required. When the eggs are perfect, and from hens in good condition, the hen simply raises the temperature to the warmth of her own body; but the chicks themselves generate warmth within the eggs and greatly assist the hen in her work, which is noticeable when the hen leaves her nest frequently—the warmth of the eggs rendering her condition on the nest unbearable, she is then compelled to expose her eggs for cooling, as the temperature becomes too high. When the eggs containing chicks are few, however, there is less warmth, and the hen remains more closely on the nest in order to impart the warmth herself. Thus it is that when a hen frequently leaves her nest she hatches more chicks than one remaining faithful to her duty; for success depends not wholly on the hen but also on the chicks themselves, which, by coöperative action, and the aid of numbers, assist themselves. It requires a closer application to duty by the hen to hatch one chick than to hatch a dozen. A nest containing eggs that are all fertile will render the task of incubation easy, as the chicks will generate sufficient heat to hatch themselves, during the warm season, if the nest is covered, but the aid of the hen is necessary until the twelfth day of incubation.

During the progress of incubation the hen shifts the position of the eggs in the nest daily, those in the center being changed to the outer edges of the nest. In winter she selects a warm and dry location, but in summer she prefers a cool situation. She is not partial to having the nest on moist ground, unless thereby she can secure a cool location; for in winter she will hatch out a full brood in the hay-loft, where the nest is as dry as possible. All the required moisture is in the egg, and, instead of the moisture from the ground being necessary, it

retards incubation, as examination of eggs under hens during incubation demonstrates that moisture is given off, instead of being absorbed. The hen is also careful to avoid draughts of air over the eggs. She will expose them to the air, but when she covers them she excludes draughts across them. This is done to prevent too rapid evaporation of the moisture in the eggs. The chicks assist themselves to leave the eggs, the hen giving no aid whatever except to keep them warm and well-protected from currents of air.

Difficulties and failures are often ascribed to the hen, when the cause lies in imperfect eggs. The frequent success of the hen that steals her nest has led to indiscriminate condemnation of all unsuccessful hens; but the very fact that a hen steals away to make a secluded nest is proof that she has full liberty to roam and forage, and is in prime condition. As all the eggs in the nest are hers, and from parents in full vigor, the chicks are uniform, and if one egg hatches all should hatch; but the sitting hen that has been confined in a yard, and given mostly grain as a principal food, is not in a perfect condition, and will not produce as strong chicks as will the hen that has the privilege of selecting the required materials. When eggs are given to a sitting hen they may vary in many respects, yet this important matter of selecting only perfect eggs for incubation receives but little consideration.

The production of eggs in the winter season and the hatching of broods is really an artificial process to a certain extent the conditions of spring being imitated by the use of warm quarters and nourishing food. The true season of laying is in the beginning of spring, and until the moulting period. The males and females are then active and full of vigor, and the eggs will give better results in the number of chicks produced, while the hens will encounter less difficulty in hovering and caring for their broods. During the winter season the males may be incapacitated by severe cold, their combs frequently becoming frozen; an excess of fat on the male

will also destroy his usefulness as a sire. These are among the many causes for eggs not being fertile.

The difficulty of raising a brood of chicks in winter is much greater than in spring or summer. Some hens will not become broody in winter unless under very favorable conditions. The chick is really naked when hatched, the down being no protection, and the slightest exposure to extreme cold will cause fatal results. Roup is the winter scourge, and attacks chicks in a different manner from adults, and the loss of chicks from bowel disease is the effect of roup, caused by exposure to cold or dampness. As the chicks grow the hen is sometimes unable to hover them, and for that reason the loss is sometimes greater among chicks of the age of four or five weeks than among those more recently hatched. The custom of using eggs for incubating purposes without regard to the source of the eggs, leads to the hatching of chicks of no uniformity, and there will necessarily be some that are more vigorous than the others. These vigorous chicks will keep the hen in constant anxiety, and her restlessness will usually end with the loss of the weaker members of the brood which are physically unable to keep pace with the stronger chicks, and as the hen does not hover them sufficiently they slowly succumb to the cold.

The strongest chicks are those hatched from eggs laid by hens that are full of energy. Hens that scratch from morning until they go on the roost, and have plenty of exercise, produce the hardiest chicks. The hen does not differ from other animals as a breeder. It is well known that pigs from a fat sow are usually puny, and the same may be said of the young of other animals when the dams are over fat. A fat hen does not lay regularly, and her eggs will either fail to hatch or produce weak chicks. Often it happens that such chicks die in the shells, and the fault is charged to the sitting hen. Until poultrymen learn to feed the hen on something more than grain, and to feed her with a view of keeping her in a laying condition, failures to hatch may occur with eggs from the best

flocks known. It is not sufficient to have the eggs hatch, but the hatch should be of strong and vigorous chicks, in order that but few losses may occur. In the spring and summer, when the hen can secure a variety and is at liberty to exercise, the eggs produce better hatches, and the chicks are not so easily injured by cold; but drawbacks seem always to remain, as the lice are as annoying in the warmer season as the cold is at the earlier period. The judgment and observation of the poultryman are more helpful to success, however, than advantages of the season.

WORKING A LIVE INCUBATOR.

Miss Carrie T Meigs, a northern Vermont lady, gives the following account of her method of working what she calls "the natural live incubator."

"Success with this incubator depends upon a turkey and a sitting hen tame enough to handle. Never set a hen that flies off the nest when you approach, or one that pecks your hand fiercely while you are putting the eggs in the nest. Last season I set a Barred Plymouth Rock hen, March 25, in my hen-house. The ground was all covered with snow, so I could not set her there, which is the best place. As soon as the weather was warm enough, I moved her outdoors and set her under a box on the ground. July 25 I took her off the nest and made her go with the other hens; but she was determined to get back to her nest during all that day. This hen had sat continuously 123 days. In the fall, I dressed her and sent her to Boston with a No. 1 lot, and she was as nice and fat as any.

"A turkey will take care of anything, whatever its size, while a hen will kill any but her own chicks, hence a turkey is a first-rate brooder. Sometimes I set the hen on duck's-eggs, then on hen's and then on turkey's-eggs, just as I had a supply. When she hatched a brood I took them to the brooders, *i. e.*, the turkeys, and they brooded them with their own little ones. At last the old gobbler, noticing the great size of the families,

turned brooder too. Instead of going to roost as usual, he would sit down in the meadow and brood the little ones, with the hen turkeys. I have heard people tell about hens "sitting themselves to death"; but I have proved that with proper management they will sit indefinitely and be none the worse for it.

"Now for the management of the incubator or hen: First, buy at a druggist's some pyrethrum, buhach or insect-powder, costing 50 cents per pound. I would have it, if it cost me \$5 per pound if vermin troubled any of my live stock. It is sure death to all kinds of lice and it can be used with perfect safety, and there is not much trouble in applying it, which is a matter of considerable importance with a busy farmer. If the weather is warm enough, set the hen outdoors, under a good-sized box in a cool, shady place—under a bush or low-growing tree. In the construction of an incubator like mine, you will need a sitting-hen, a hoe, a box, some fine chaff and a little straw. With the hoe scrape away the sod, shaping a rather shallow nest in the ground, then put in the chaff and lastly the straw, placing it around the edge of the nest rather than in it. A flat, shallow nest with straw arranged around the edge I consider the best. Place the eggs in the nest, turn the box over it, and then having raised the latter a little, slip in the hen and the incubator is all completed and in running order, and I will guarantee it to hatch well; in fact, every fertile egg in good condition will produce a chick, if the hen is properly cared for—at least, such has been my experience. I set two hens, one on 13, the other on 15 hen's-eggs, and all hatched. I also set three hens on duck's-eggs, putting 10 apiece under two hens and 11 under the other, and all hatched.

"Every morning, at a regular time, lift the hen off the nest; putting your fingers under each foot, and the hen will curl her toes around your fingers when you lift her up. Unless you do this there is danger of her striking the eggs together and cracking them. Turn the box over the eggs while the hen is off, so that nothing can disturb them. Provide fresh water,

feed and a dust bath every morning. For the feed I give some kind of grain and some soft feed in separate dishes. Remain near at hand and when the hen starts toward the box, raise it a little and she will crawl under and attend to business until the next morning. Caring for the hen in this way causes some work, but I could not afford an artificial incubator, being only a poor farmer's daughter, so I discovered the next best thing. About once a week I dust pyrethrum powder out of an old pepper-box in among the hen's feathers, and also into the nest after carefully removing the eggs. A box with a tight roof that will thoroughly protect the hen when it is raining, is necessary. I keep a small block of wood under the edge of the box to let in air, and on hot days I put under it a large block and substitute a smaller one at night, so that no rats can get in. This year I shall use one-inch mesh wire netting around the edge of the box."

SEPARATE BUILDINGS FOR SITTING HENS.

Mr. Henry Hales gives this description of his plan: "I have a small building divided by a wire partition into two parts, with a door from one to the other, and a small yard made with a wire netting, also divided. I have a slide from each compartment into each yard. The size of the house will depend on the number of chickens desired. Two rooms two by six feet, with yards twice that size, will be large enough for 14 hens to sit in, and if these sit twice it will be equal to 50 sitting hens. In some cases the houses may be used a third time, and thus several hundred chicks may be raised in them.

"When my hens get broody I set a lot together in one house, using small, shallow boxes for nests—not over 11 or 12 inches square—so that two hens can not crowd into one nest. I set these on the floor all around the sides and a few inches apart, so that a greedy hen can not reach the eggs in the next nest. I have water and food in the house, so that the hens can eat or drink at any time when they come off the nests. There are no

perches in the house, or anything else they can get on above the nests. A dust-box sunk level with the floor, containing sand and ashes, and with a little carbolated lime or carbolic acid sprinkled in from time to time, placed where the sun shines on it through the windows on bright days, will keep the hens clear of parasites. A little sod or grass in the yard is good for their health. I don't have trouble once in fifty times in removing a sitting hen. I let her sit a few days in the nest she has been laying in, to see that she is in earnest; then I remove her some evening to the sitting-house, place her nest on the floor (as above), and if a number of others can be removed at the same time, so much the better. Then I hang something up over the window to shade the light a little. This I leave for a few days until I am sure that all the hens mean business, and as soon as they settle down I remove the shade, and leave the slides into the yard open, that the hens may get fresh air whenever they please.

"The advantage of this system may be easily seen by those who have had to spend a large portion of their time in spring watching the sitting hens or lifting them off and driving them back to their nests every day. As many as possible should be set at or about the same time—a few days are not of much consequence—so that if the hens change nests it would be of no importance, and if there are no more nests than hens, and the nests are a little way from each other so that the hens can not quarrel, things will go on very smoothly.

"The second batch of sitting hens should be set in the next compartment so that they may all come out together in the same way as the first. The house should be well ventilated every day and never be tightly closed. As the hens hatch they should be removed with the chicks to their coops.

"Of course, the nests should be looked to and kept clean, but if a little sulphur be sprinkled in them, or, as is better, some tobacco stems used with the straw in making them up, few will be troubled with vermin. The hens should be lifted off at times, if they do not get off of their own accord, to see that

no broken eggs foul the nests. If only a few chickens are wanted, a place four by eight feet, with a low roof and a door opening outward in each room, if divided, will answer well.

THE MACHINE AS A MOTHER.

CHAPTER V.

A FEW POINTS ON INCUBATORS.

P. H. JACOBS.

THERE are about a dozen makes of incubators on the market, each claiming some special advantage in the mode of providing air and moisture, and some are warmed with dry air while others are warmed with hot water. The methods of regulating are various—some using thermostatic bars (made of hard rubber), some regulating by the contraction and expansion of metals, some by the expansion of water, and some by the use of mercury. The system of regulation is of no consequence provided there is a proper degree of temperature maintained in the incubator, and the eggs are provided with the necessary amount of air and moisture, whether that amount be great or little.

While mechanical ingenuity has perfected the incubators in a manner to render them perfect in mechanism, and to comply with all that may be claimed for each incubator, yet no manufacturer or operator can control the main factor in the process—the egg. With all that has been done by man in his attempts to supersede the hen in the work of incubation, the subjects of his operations—the eggs—are beyond his influence, and despite all that he may perform in supplying perfect regulation of temperature, air and moisture, the hatching of the eggs is still more or less a matter of chance, and the hen herself is subject to the same uncertainty. An incubator filled with eggs that are nearly all fertile may make a large hatch at one

time and fail at another time because of inferior eggs; and even the fact of the eggs being fertile does not insure a hatch, as the parents of the chicks may be lacking in vigor, and may transmit their constitutional defects to their progeny, thus rendering the process of incubation a matter of individual treatment, each chick requiring warmth, air and moisture of a degree requisite for its own progress. It is impossible to meet these wants separately, and hence some chicks will come out strong and vigorous, while others are weak, or die in the shells. Until the operator becomes capable of so managing his hens and selecting his eggs for incubation as to enable him to anticipate the results, he will succeed with some hatches and fail with others. As long as operators buy their eggs for incubation the work will be uncertain, no matter which make of incubator may be used.

There are some who rely too implicitly on regulators, and thus fail to bestow that attention which would be given if the incubator depended exclusively upon observation. Regulators are intended to *assist* the operator—to lessen his care, not to relieve him entirely. Many hatches have been ruined from the lack of attention to the incubator when the chicks were coming out, the animal heat of the chicks raising the temperature to a degree beyond the capacity of the ventilator to lower, and yet every part of the incubator worked regularly. The farmer is willing to sit up all night to save a litter of pigs from a sow that is expected to farrow, and many hatches of large incubators require the same care and assistance at the critical period instead of reliance on the automatic appliances of the incubator. Intelligent supervision is as important in the management of an incubator as with the steam-engine that is regulated by a governor.

Much has been written in regard to the necessity of air and moisture in incubators; and some manufacturers, who are unexcelled as expert mechanics but who may be lacking in a knowledge of the requisites in hatching, make a specialty of providing amply for the ingress of fresh air, previously

warmed, and either afford a copious supply of moisture, or provide the air with what they suppose to be the proper amount of moisture, which they endeavor to regulate with water-pans, the humidity being indicated by a moisture-gauge; but it is a matter for discussion whether air and moisture are required at all times, and whether these apparent essentials depend upon the seasons and the humidity of the atmosphere—the location of the incubator more or less affecting the result.

Artificial incubation has been but an attempt to imitate the hen. We know that a temperature of 103 degrees Fahrenheit is required for the period of three weeks, and we know that the hen changes the position of her eggs, and in so doing she turns them, but we know nothing of how she supplies air and moisture, if, in fact, she supplies either. That all the eggs are not kept at a temperature of 103 degrees the whole of the time is known by the hen exposing them, in rotation, to a less warmth than when they are in the center of the nest; but she never voluntarily cools them unless driven off the nest by the animal heat of the chicks in the eggs, or in order to feed.

At all periods of incubation the hen carefully guards the eggs against *currents* of air. No draughts flow constantly across them, and she never imparts moisture at any time. The eggs are provided with a sufficiency of moisture naturally. Experiments made with eggs from the hen and the duck, in a comparison and test with eggs of both, in incubators and under hens, show that the first process in the disposal of moisture is not to secure it but to get rid of it by evaporation; the air sacs at the large ends of the eggs enlarging more rapidly under hens than in the incubators, and the eggs of the duck evaporating their contents of moisture more rapidly than the eggs of the hen. These facts lead us to suppose that, as the air in the nest of a sitting hen is *still* (not circulating in currents) and the nest is *dry*, there is no room for thought in the matter of supplying eggs with currents of air, laden with moisture, in incubators. Too much moisture and warmth not only prevents the creation of space in the egg for the growth

of the chick, but induces rapid growth of the embryo, until it is too large to remain in the egg and too young to emerge, the result being that it dies in the shell. In this connection it may be stated that as good results have been obtained in incubators that allowed no flow of air, and in which no moisture was allowed, as in the reverse conditions—the air being motionless, not requiring saturation. When chicks come out of the eggs they provide a large amount of moisture themselves, and are then subject to being chilled from rapid evaporation in the warm dry air and warm moisture; the consequence being that a hen, when her chicks are coming out, will sit more closely on the nest than at any other time, and will resist any attempt at disturbance just at that period; a fact which is a strong protest against opening the incubator to remove the chicks until all are hatched and dried, as there will then be a sudden fall of temperature, due to the removal of the sources of animal heat, which is often fatal to the chicks yet unhatched.

Having referred to the hen by way of illustrating some thing that may be required with the incubator, a few condensed rules will probably be of value to the inexperienced :

1. An incubator can be more easily operated in a room of even temperature, and it should never be placed near a window, as that side nearest the window will be cooler than the side away from it.

2. Place your eggs in the trays or drawers, and then cull out all that are extra large, small or rough, and fill the spaces with more perfect eggs.

3. Keep the temperature at 103 degrees. Do not cool the eggs. Turn them twice a day.

4. The cause of chicks dying in the shells may be due to too much moisture, too high temperature, too low temperature, lack of constitutional vigor of parents, too frequent opening of the incubator, or to the fact that the eggs are from hens that are overfed and fat.

5. When the chicks do not hatch out until the time is past,

it indicates that your temperature was too low. If they hatch on the 19th day it indicates that the temperature was higher than necessary.

6. No one can be successful who depends on procuring eggs from all sources. Such eggs are "unknown quantities."

7. A Leghorn male mated with large hens, particularly of the Asiatic or American breeds, produces chicks that will grow rapidly and sell well as broilers, and the eggs from hens so mated are usually fertile.

8. Eggs from hens in confinement and which are overfed, either fail to hatch or produce puny and weak chicks.

9. Small incubators, of a capacity not exceeding 200 eggs, give the best results. It is easier to secure a sufficiency of fertile eggs for a small incubator than for a large one, hence the risk and expense is less.

10. As eggs may cost three cents each in winter, the first cost of each chick depends upon the number of eggs used during the hatch and the proportionate number of chicks secured. The larger the hatch the less the cost of each chick.

11. Five cents worth of food will produce one pound of meat, either of duck or chicken.

12. A chick is naked when hatched, the down being no protection. In winter the chicks should at no time become chilled. They must be treated as carefully and tenderly as babies.

13. Like the hen, the chicks need exercise. Keep them busily scratching, providing litter for that purpose, and they will escape leg weakness, and have better appetites.

14. When bowel disease appears it is usually due to colds, principally from the lack of warmth at night. Currents of air over them are to be avoided.

15. When chicks droop, and appear sleepy, the cause is usually large gray lice on the heads and necks.

16. Dry food is best for chicks, and they should be fed three times a day, but millet seed and screenings should be scattered in the litter in order to induce them to work and scratch.

17 Give no food the first 36 hours. Then allow rolled oats, scattered for them to pick up, and also stale bread-crumbs dipped in fresh milk, which should be placed in little troughs. After the fourth day give the bread and milk as a morning meal, rolled oats at noon, and cracked wheat and cracked corn at night. Occasionally allow a little chopped eggs or meat.

18. After they are ten days old feed them anything they will eat, compelling them to scratch for as much as possible.

19. Water must be given in a manner to avoid allowing the chicks to become wet. Grit, such as pounded shells, broken china, or any sharp, hard material, should be kept always within reach of them.

20. The main requirement is warmth. When the chicks crowd together at night, it indicates a lack of warmth. When they separate under the brooder it indicates that they are comfortable. In winter the warmth under a brooder should not be less than 90 degrees or over 100 degrees. As they will separate, and seek the edges of the brooder, the temperature should be about 95 degrees.

21. Keep the brooders clean. Do not attempt to ventilate the chicks with cold air. As a chick is close to the floor it will secure all the pure air necessary. The difficulty will be to avoid the cold draughts instead of inviting them.

22. Always examine your lamps, or sources of heat, as well as the position of the chicks in the brooder, about bed-time, and come out very early in the morning for the same purpose.

23. Feed a variety of food if possible; but cracked wheat and cracked corn should not be omitted after the chicks are old enough to eat them. For green food in winter use clover hay, cut very fine, and scalded. Milk, when fresh, may always be allowed, but never when sour. When bowel disease appears feed boiled rice; but as bowel disease is nearly always due to lack of warmth, the heat in the brooders is the important point.

BROODERS.

Almost every poultry-keeper who raises 100 or more chickens uses a brooder. Many who do not use incubators find brooders indispensable. The chicks are hatched under hens and as soon as they are dry are placed in a warm brooder, and another setting of eggs is placed under the hen. Cheap and serviceable brooders are made by dealers everywhere. For the benefit of those who desire a home-made article, we give descriptions of two that have proved successful.

Fred Grundy uses the ones shown in *Figs. A and B*.

The brooder complete is shown in *Fig. D*, while *Fig. C* is the shelf or partition on which the tank rests. The whole thing is 24 inches square and 12 inches

BROODER.—*FIG. D.*

deep. The tank is 16 inches square and five inches deep. It rests on pieces of lath laid across an opening 14 inches square, cut in the center of a shelf or partition which is supported by cleats nailed to the sides of the box. The hover cloth *H*, is cut in pointed strips as shown, and is tacked to the pieces of lath. Heat comes from boiling water poured into the tank. During the first ten days of the young chick's life it is enough to draw off six quarts of water three times a day and replace this with a like quantity boiling hot. It is poured in at the top pipe and drawn off at the side. The pipes are closed with corks. When the chicks first go into the brooder, the drawer *D* (see *Fig. B*) in which they are placed is run on the cleats, so as to get them up close to the heat. After about ten days the drawer is run at the bottom of the brooder, thus giving more room. There are four one-inch holes, one at each corner, for ventilation. In *Fig. D* is a large door *X*, to the brooder and also a smaller one, *S*, for use in cold weather. When the chicks are large

enough to keep themselves warm, they may be taken from the brooder and placed in a coop like the one described under

"Poultry as Insecticides."

Another form of brooder, in which the heat is placed below the chicks, is shown in *Fig. E*. This is a box 16 inches each way. It is lined with flannel, carpet or felt, with several thicknesses of the same material outside, and the whole encased in a second box like an outer shell.

This is to retain the

heat. A thick door is made for it and a shelf of lath placed half way down. A nest-box lined with paper is placed on the shelf. Below is a tin box with suitable arrangements for filling and emptying. This is kept filled with hot water.

R.N.Y.

Eggs

BROODER.—FIG. E.

BROODER.—FIG. B.

BROODER.—FIG. C.

Blankets packed above and around it will regulate the heat. Holes at the top and sides, closed with corks, give necessary ventilation. The chicks are placed in the nest-box, where they are fed and watered until large enough to turn out in a coop.

BROODER.—FIG. A.

A HOME-MADE INCUBATOR.

It is useless to attempt to give a discussion of the relative merits of the different makes of incubators. It is with these machines about as it is with the different breeds of live stock.

INCUBATOR.—FIG. H.

What suits one man's location and habits may not suit another's. The incubators are well described in papers and pamphlets, and are always on exhibition at poultry-shows, where they can easily be compared. We give here simply a

description of a well-known hot-water incubator which may be made by any carpenter.

With the help of the illustrations in *Figs. F, G* and *H*, but little difficulty need be experienced in making an incubator; and as the one here described is in general use, it has been fully tested and found to perform all that may be reasonably expected. *Fig. F* represents the interior of the incubator. It may be noticed that there are an outer and an inner box, with

sawdust between them — chaff or any other material will answer. The outer box is 48 inches long, 44 inches wide and 26 inches high. The inner box is 40 inches long, 32 inches wide and 18 inches deep, and holds a tank 32x36 inches. The

INCUBATOR.—FIG. G.

outside measurements are used in measuring boxes. A is the outer box and B the inner. CC are strips one inch wide and one inch thick, with iron rods $\frac{5}{8}$ of an inch thick (f f) upon which the tank rests. DD are similar strips (but no rods) for supporting the egg-drawer. E is a $1\frac{1}{2}$ -inch tin tube, two feet long, which admits air into the ventilator (space under egg-drawer). The ventilator is five inches deep, and is the same length and width as the tank. *Fig. G* shows a sectional plan: A is a tube extending through the incubator into the tank. B is a faucet for draining off the water. C is the egg-drawer. D is the tin air-tube. The egg-drawer C is four inches deep, outside measurement, and should be made of light material. It is 39 inches long and 30 inches wide, containing three movable trays, $1\frac{1}{2}$ inches deep, and of size to fit in the drawer. The bottoms are thin strips (one inch wide and one inch apart, to both drawer and trays) over which muslin is tightly drawn and tacked. The tank is seven inches deep. The faucet is detachable, and screwed in, when desired, on a thread. The tube on top is seven inches high. The front of the egg-drawer is also boxed off and filled with sawdust.

It requires about 115 feet of lumber (1-inch tongued and grooved boards), and the cost of the tank is about \$5. The plan of the tank is shown in the sectional view given. When completed the incubator is simply a box, appearing as in the cut, *Fig. H*.

HOME-MADE INCUBATOR.—FIG. F.

In building, one may follow any plan that may be preferred, as it is not necessary to conform to any particular design.

Fig. I.

Have the floor close. This is necessary to make the room warm for keeping the eggs in a uniform temperature; but do not attempt to have any tube for the escape of air. Opening the

drawer to turn the eggs provides sufficient ventilation.

Each tray, *Fig. I*, holds about 80 eggs laid in promiscuously, the same as in a nest, making the total number for incubator 240 eggs. Fill up the tank with boiling water, but never allow it to remain in the tube on top, as it thus increases pressure; hence, when the tank is full to top of tube, draw off a gallon of water. Fill it 48 hours before putting eggs in, and have heat up to 115 degrees before they are put in. As the eggs will cool down the heat, do not open the drawer for six hours, when the heat should be 103 degrees, and kept as near to that temperature as possible until the eggs hatch. It is best to run it a few days without eggs, to learn it thoroughly. Place incubator in a place where the temperature does not fall below 60 degrees. As it will heat up slowly it will also cool off slowly. Should it be difficult to heat up, or the eggs be too cool, you can raise or lower the trays, using small strips under them. You can also stop up or open the air tube in the front of the ventilator whenever you desire. When the eggs are put in, the drawer will cool down some. All that is required then is to add a bucket or so of water once or twice a day, in the morning and at night, but be careful about endeavoring to get up heat suddenly, as the heat does not rise for five hours after the additional bucket of water is added. The cool air comes from the ventilator pipe, passing through the muslin bottom of the egg-drawer to the eggs.

Avoid opening the egg-drawer frequently, as it allows too much escape of heat, and be careful not to open it when the chicks are hatching, unless compelled, as it causes loss of heat and moisture at a critical time.

Cold drafts on the chick at this time are fatal. Do not oblige visitors. Be sure your thermometer is true, as half the failures are due to incorrect thermometers. Place the bulb of the thermometer even with the eggs—that is, when the thermometer is lying down in the drawer—with the upper end slightly raised, so as to allow the mercury to rise; but the bulb and eggs should be of the same heat, as the figures record the heat in the bulb, and not in the tube.

Turn the eggs twice a day at regular intervals—six o'clock in the morning and six o'clock at night. Do not let them cool lower than 70 degrees. Turn them by taking a row of eggs from the end of the tray and placing them at the other end, turning the eggs by rolling them over with your hand. By removing one row you can roll all the rest easily. Give no moisture the first week, very little the second, and plenty the third week. Do not sprinkle the eggs. For moisture, put a wet sponge the size of an egg (placed in a flat cup) in each tray the second week, and two sponges in each tray the third week. Do not put in sponges until you are about to put up the drawer, after turning. Wet the sponges by dipping in hot water. After the first ten days the animal heat of the chicks will partially assist in keeping the temperature. Be careful, as heat always drops when chicks are taken out. You can have a small glass door in front of the egg-drawer, to observe the thermometer, if desired. Always change position of trays when the eggs are turned, putting the front one at the rear. After the 14th day spray the eggs twice a day with water warmed to 110 degrees, using an atomizer, and do it quickly.

HEN HEALTH.

CHAPTER VI.

A POULTRYMAN'S MEDICINE-CHEST.

HENRY STEWART.

THE greatest cause of sickness and death among poultry is over-feeding. The common practice is to give the fowls all they will eat, as if fowls were wiser than hogs and knew when they had enough. Fowls and hogs, and even cows and horses when they can get at a meal-bin, never know how to stop until they are gorged full to the top of the throat, and then trouble begins. First, there is indigestion, then fever, then cholera or fever and gangrene of the intestines, or inflammation of the mucous membrane, which is catarrh or roup; or anthrax, which is black-comb, and other fatal disorganizations of the muscular tissues and the liver. In these cases medicine is of little avail, and the only remedy is a sharp little ax, which might justly be fitted in the top of the medicine-chest as the most effective remedy for most of the diseases of poultry.

The next great fault is the want of perfect cleanliness, which includes pure water, pure air, a clean floor, a clean run for the chicks, the utter absence of vermin, and a wholesome variety of food. No medicine whatever can cure the evil results of this want, except the ax aforesaid, and the deep burial of the virulent contagion produced by this second grand mistake. During the last three years I have not had one sick fowl, nor have I lost one chick which has been safely hatched, and this comfortable result has been due to the exercise of these precautions and the costly experience of previous losses which I

could have avoided had I learned how. But it takes years and years to learn how to do this, and in the meantime some help can be gained through simple medicines.

The second article of special need for the medicine-chest is a barrel of lime, kept in an open, dry shed, where it will become air-slaked into a fine, dry, pungent powder. This is to be liberally dusted over the floor, the perches, the nests, and the walls of the house two or three times a week, after it has been cleaned thoroughly of all the droppings ; and just at sundown when the fowls are about to go to roost. The fine dust is breathed and makes the fowls sneeze and wheeze, and clears out their throats and nostrils, destroys gape-worms, and cures any possible irritation of the nasal and bronchial membranes. I consider this "a great popular remedy," worth a million boxes of roup-pills, catarrh and cholera specifics, "eggine," egg-powders, and all the other quack nostrums offered for 50 cents a pound, and very much cheaper. It also keeps the scab-mite, which produces the unsightly scaly leg, at a distance and chokes off lice, fleas and red mites.

Something, however, may usefully be kept in readiness for accidents ; and I find a bottle of a mixture of raw linseed oil with one-fourth part of kerosene oil and a fortieth part of creosote, is handy as a complete remedy for scaly leg, and also for the small vermin, when it is liberally applied to the perches, especially in every crevice where they may hide. A solution of one ounce of chlorate of potash in a pint of water, applied with a clean feather or one of the little squirt fillers used for stylographic pens, to the nostrils and throat, a little also being sent down the throat to the stomach, is a sure cure for croup, diphtheria, sorethroat, pip or scaly tongue, or for a purulent discharge from the eyes. I have cured every case of cholera, or the green and yellow discharges which happened for two or three years before I learned how to prevent them, with one teaspoonful of a solution of one ounce of hyposulphite of soda in a pint of water ; and this is the last item of my list of medicines for poultry.

As a warning against spending money uselessly, I might

refer to the various preparations and mixtures sold as poultry-powders and egg-producing food. One of the most highly recommended of these was once analyzed and found to consist of wholly useless and very cheap materials, with a little Cayenne pepper to give it flavor. All these are useless, and I believe do harm; just as the quack medicines for infants and older people are to be avoided, these should be, with the costly crushed shells which are, at the best, indigestible, and which are not nearly so good as fresh bones broken up with a hammer on a block in the yard, and which furnish all the lime required, in a digestible form.

THE THREE WORST DISEASES.

DR. F. L. KILBOURNE.

Fowl Cholera.—This is a highly contagious, bacterian disease, very fatal to all fowls and birds, and due to the presence in the system of a living microscopic organism or bacillus. The disease can not be produced, as is very commonly supposed and so stated by some writers, by filth, want of care, or any other unhealthy condition, except this germ of the disease is present. Then it is that the above unhealthy conditions greatly favor its spreading, and increase its mortality. The germs are generally taken in with the food or drinking-water, and then find their way to all parts of the system; while the disease is readily spread by contact with diseased animals or any of their products. The symptoms, like those of most other diseases of poultry, are not altogether satisfactory. There are usually dullness, ruffled feathers, drooping of head and wings, unsteady gait, a greenish yellow diarrhœa, sometimes frothy, and later frequently bloody. The comb and wattles become very dark-colored or black. The fowls seek the sunshine or crowd listlessly together to keep warm. Any or nearly all of the above symptoms are absent in some cases. But whenever the fowls are dying rapidly without apparent cause, and fowl cholera is in the neighborhood, it may be suspected, and pre-

cautions taken accordingly. Treatment is rarely desirable on account of the very contagious nature of the disease, although a considerable number may recover, especially after the disease has prevailed for some time. Its "stamping out" and prevention are very simple and comparatively easy if thorough measures are at once adopted and carried out. First kill or isolate all diseased fowls, and burn or bury very deeply—at least three feet—all dead animals and their products. Then thoroughly disinfect the whole interior of the hen-house and the runs by washing or freely sprinkling with a solution of sulphuric acid—acid one pint, water eight gallons. Where the fowls are allowed to run at large, it will be necessary to confine them to smaller quarters, so that the whole may be disinfected. Watch the healthy flock carefully, and remove any showing symptoms of disease. Use the disinfectant generally three or four times a week, and daily on the droppings, as long as cases of the disease continue to occur. A few drops of the acid in the drinking-water will also act as a preventive. Where the fowls were running at large when the outbreak occurred, it will be safest to keep them confined for three or four months after the disease has all disappeared, so that the germs that may be lying hidden about the place will have time to die out. Fowl cholera, like most other contagious diseases, will die out of itself when there are no suitable animals for it to prey upon.

Gapes.—Another contagious affection of fowls is known as gapes, or as it is sometimes called, "pip." It is a disease especially of young birds, with which it is very fatal, and is due to the presence in the trachea—windpipe—and bronchi, of the *Syngamus Trachealis*, a small red worm, three to five-eighths of an inch in length, and apparently forked near one end. The old birds frequently harbor the worms, but with them they rarely prove fatal. The symptoms are very characteristic. The young bird will occasionally open wide its mouth and gape or gasp for breath. Breathing gradually becomes more difficult, the animals gape more frequently and finally droop

and die. Various methods of treatment are in vogue, all of which are more or less successful, but none entirely so. Turpentine or strong camphor placed upon the outside of the throat, to be inhaled, is relied upon by many, and is very successful. A few drops of either may also be placed in the food. Another method is to place the chicks in a covered box, in the bottom of which is a layer of air-slaked quick-lime. The box is shaken to "raise a dust," which the chicks are forced to inhale for one or two minutes—not longer. Either method should be repeated on any of the birds showing the first indication of gaping. The worms may be partially or entirely removed with a small twisted loop of horse-hair or with a hen's-feather stripped of its plumes except near the tip. The mouth being well opened by an assistant, the loop or feather is to be carefully introduced into the opening seen in the middle of the back part of the tongue, and pushed gently down the windpipe to its lower end, a distance of two or three inches; then twist it around several times as it is gradually withdrawn. If successful, one or more of the red worms will be removed. The operation may be repeated two or three times, and again at intervals whenever necessary. The chicks must be handled very carefully or the treatment will be worse than the disease. If the loop or feather is dipped in camphor, turpentine, salt or tobacco solution, the worms not removed may be killed and later coughed up by the chicks. [Turpentine has succeeded with us.—Eds.]

To prevent the spread of the disease, burn all of the worms found and also the dead animals, or at least their respiratory organs. Move the young birds to new quarters and saturate the ground of the old quarters with a strong solution of salt, coal oil, kerosene or turpentine. In generally infected localities it may be necessary to keep the young fowls indoors or on a concrete floor or platform outside. This is an effectual preventive on the worst-infected places, if care is taken that no infected food or water is supplied. Pure rain or spring-water should be used, otherwise the water should be boiled. Small

infected yards may be made safe by soaking the ground with one of the above solutions.

Roup or Croup.—The usual causes of roup are cold, dampness, wet, and exposure. Although apparently contagious, the outbreak and spreading of the disease are probably due primarily to the surroundings instead of being transmitted from fowl to fowl as in the cholera. The symptoms are, loss of appetite, dullness, ruffled feathers; the breathing becomes rapid, accompanied by a wheezing or crowing sound. There is a discharge from the nose and mouth, at first thin and later thick and fœtid. The head and eyes frequently become swollen. Yellowish white fibers and raw sores appear upon the tongue or in the mouth and throat. The nostrils are frequently swollen shut so that the animal is obliged to breathe through the mouth. Red swellings and false membranes also frequently appear on the face, about the eyes and on the combs and wattles. Diarrhœa usually sets in later. In the treatment of this disease a change of food is usually desirable. Feed green or cooked food—vegetables and puddings of rice, oat or corn-meal. The false membranes may be removed with the forceps, and the swellings and raw sores bathed with a solution of nitrate of silver—15 to 20 grains in a wine-glass of water. Dissolve a dram of chlorate of potash in each pint of drinking water. If the head is much swollen, bathing two or three times daily with water acidulated with vinegar or boracic acid will afford relief. If there is diarrhœa, give a grain of sulphate of copper, a teaspoonful of quinia wine or brandy twice or three times daily. A little Cayenne pepper may be advantageously mixed with the food. Provide the sick fowls with a comfortable, dry, warm, sunny place.

BRIEF NOTES ON FOWL DISEASES.

P. H. JACOBS.

The disease most prevalent in the fall, winter and spring is roup, which kills more fowls in this country than cholera and all other causes combined. Roup is due to colds, and may be

brought into the flock by contagion, by dampness, by exposure to winds and by improper shelter. There are several forms of roup, but the signs are discharges from the nostrils, swelled heads and eyes, hoarse breathing, and whitish sore throat. When the eyes are swelled, bathe once a day with warm water, and anoint with a few drops of glycerine. If the bird breathes hoarsely, give a pill composed of equal parts of quinine, bromide of potash and asafœtida, the size of a bean, three times a day. If sore throat results, swab the throat with a solution of sulphate of copper. Add a teaspoonful of carbolic acid to each gallon of drinking-water.

Cholera is always known by intense thirst, debility and anxious expression and greenish droppings. The best remedy is to add a teaspoonful of liquid carbolic acid to each half-gallon of drinking-water, and give a mixture of 10 drops of paregoric and 5 drops of spirits of camphor, twice a day.

Gapes is the result of suffocation caused by a small slender worm. Numbers of them cluster together. A drop of spirits of turpentine on a bread-crumb twice a day is the best remedy. The vapor of carbolic acid will also cure the difficulty. Chicks alone are subject to gapes.

If roup and cholera can be kept out of the flock, half the battle will be won. To avoid disease of any kind follow these hints.

Never have your fowl too fat, and you will seldom have cases of egg-bound, double-yelked eggs, or soft-shell eggs. Hence, do not feed largely of grain.

Nearly all ailments are due to the lack of grinding material in the crop. Always keep broken glass, pounded crockery or sharp flint-gravel within reach of the fowls. Cold draughts of air blowing across them or down on them will cause swelled heads and eyes, and finally lead to roup. It is often the case that weak legs may be caused by high roosts, the birds being injured by jumping therefrom to the ground. When the roosts are low and yet a hen is unable to stand on her legs, remove her from the male at once, as the cause may be traced to him, especially if he is very heavy.

Feather-pulling is due to idleness, and not to a lack of something in the food, as many suppose. Active birds, if confined and not exercising, will pull feathers, but the habit is easily acquired from any one of the flock by the other members thereof.

Hens do not eat their eggs unless they learn the habit from having eggs broken in their nests. Never use stale eggs as nest-eggs.

A dust-bath is the toilet of the hen. It is her mode of keeping her body clean. If given a dusting place she will keep the vermin off if you keep the poultry-house clean.

The great source of contagion is the drinking-water. A sick fowl should never be allowed to drink from the same vessel with the others.

On very cold nights a large flock will be more comfortable than a small one, as there will be more warmth in the poultry-house.

A crack in the wall, or a hole as large as the head of a nail will cause more damage than if the whole front of the house is open, provided the rear and sides are tight.

Never give medicine to healthy fowls. Feeding sulphur and adding Douglass Mixture to the drinking-water, should only be done when necessity requires.

Pale or dark comb is not a disease, but indicates that the bird is not well. A healthy fowl always has a bright scarlet comb.

Salt is necessary. Season the food with salt whenever it can be done, but only slightly.

Crop-bound usually results from the bird eating long grass, long rags or rope, or some substance that stops the passage leading from the crop to the gizzard.

The best place for a sick bird is the bottom of a flour-barrel, straw being used for bedding.

No gases arise from frozen droppings, but the poultry-house should be cleaned daily, if possible, and dry earth should be sprinkled on the floor, which permits of sweeping the latter with a broom. Cleanliness prevents disease.

The combs will not easily become frosted on cold days if they are anointed with glycerine. Birds with long combs and wattles should drink only from vessels into which they can get their beaks alone. A hen with a frosted comb will not lay.

Never use kerosene on the legs or body, as it often irritates and does damage.

Have roosts low. Many birds gradually droop and die from internal injury due to the constant jumping to the floor from high roosts.

As to Hen Lice.—They find a rich feeding-ground upon the bodies of the fowls. They breed in filth, swarm under boards and sticks, and spread to every crack and crevice of the poultry-house. Lice irritate the bodies of fowls, exhaust their vitality, and diminish the egg yield. How shall we prevent the ravages of the pests? First, by never letting them get into the poultry-house. Keep the building scrupulously clean. We never let the stables go day by day without cleaning. Why should the poultry-house be allowed to go dirty, until the owner is compelled to remove the heaps of filth in order to get into the building? Trash and droppings ought not to accumulate upon the floor of a building. The platform under the roosts forms an excellent harbor for vermin, unless cleaned often. A sprinkling of air-slaked lime upon the roosts is good against the vermin, but land-plaster is better for the manure. It is almost impossible to keep lice out of a poultry-house made of old sticks, rails, old boards, etc., apparently thrown together in a careless hit-or-miss fashion; but a substantial, well-built house can be made practically vermin-proof, if all flat surfaces, sides and roof are lined with tar-paper, and a good coat of whitewash is put each year upon the exposed wood surfaces, care being taken to work the brush into all cracks. Brushing the roots with kerosene gives additional security. Sometimes, in spite of all precautions, vermin appear in quantities upon hens; then it becomes necessary to sulphur each one, or fill the feathers full of Persian insect-powder, by using the bellows made for that purpose. Why do the young

chickens die? Although overfeeding, underfeeding, dampness, and neglect by the hen threaten a young chicken, one of the prime causes of sudden drooping, loss of appetite, and death, is the presence of numerous large, lively lice upon the body. The latter fatten wonderfully, while the chick grows rapidly poor as its vitality is impaired; and even after the enemies are destroyed it is difficult, and often impossible, to bring the little thing to a healthy state. Insect-powder will stave off their ravages, but grease applied under the wings will most effectually get rid of them. If the mites are upon the chicks they are upon the hen also. It is a good plan to mix insect-powder with the grease. In addition to this, let the hen-coops be frequently moved to clean places.—A. D. WARNER.

The Moulting Hen.—A moulting hen is an idler. "A short moult and a merry one" would be the rule if we could have our own way. Can we not? Can we not by special care hasten the moulting-period and thus start the hens laying earlier in the fall? In reply to these questions Mr. P. H. Jacobs says: "As the growth of the new feathers takes from the fowl the elements necessary for the production of feathers, the food should be highly nitrogenous—meat, fresh bones from the butcher, and milk being preferred. At times the bird is nearly naked; hence dry quarters and protection against exposure should be afforded. I have never observed any advantage in favor of the large or small breeds. More depends on the vigor and hardiness of each individual than upon breed. Oily foods hasten the dropping of the old feathers. Linseed meal or sunflower seed induces moulting and hastens the process. Such foods not only contain oil, but are nitrogenous, and also abound in mineral matter. They are the best foods for moulting hens, a gill of linseed meal mixed with bran being sufficient for ten hens once a day."

Philander Williams writes: "My theory for hastening the moult is to get flesh on the birds. After hens have been laying and sitting all summer, they get thin in flesh. The better the layer, the thinner she gets, so, after I am through breed-

ing, I feed mostly corn and other fattening foods. Hens thin in flesh will moult late—sure. I should suppose that moulting is harder on the small birds, because they don't have flesh enough to hurry the process along."

J. H. Drevenstedt says: "My system of handling fowls while moulting is based on the principle that no healthy animals need tonics or stimulants while growing. I discarded the medicine-chest years ago, and neither personally use, nor give to any animals drugs of any kind, excepting when actual sickness may call for a simple remedy. Fowls that are moulting are perfectly healthy, and why they should need Douglass Mixture, red pepper, and other stimulants is hard to tell. A hen that has been forced for laying needs rest if she is to moult quickly. Growing feathers and producing eggs at the same time are not calculated to hasten moulting. I turn out my hens to roam over the pastures and in the orchards, feeding them oats or wheat once a day, but feeding the grain rather sparingly. With Leghorns, Games and Spanish, moulting is severer than with our hardier breeds, and for such a farm range is almost indispensable. Leghorns are apt to lay well into their moulting period, but the above treatment will help them through the critical time. The age of a hen influences her moulting greatly. Old hens usually moult later in the season, although feeding and handling will hasten the process, but three months is the average time required for the moult."

POULTRY THAT PAY A PROFIT.

CHAPTER VII.

C. E. CHAPMAN.

THE keeping of hens has always been looked upon as a side issue of a doubtful character, and rightly, too, when managed in the slipshod manner which is a characteristic of the unsuccessful poultry-keeper.

On a farm of 75 acres it will be hardly possible to grow all the supplies needed for 600 hens and the average family. Probably 1,000 bushels of grain, all the skim-milk obtained from six cows, and vegetable food from several acres, will be consumed by that number of hens. The business requires a comparatively small amount of capital, and is a healthful and pleasing occupation for persons of both sexes who are unable to do heavy muscular work. A visit to the henneries of C. H. Wyckoff, Groton, N. Y., reveals the fact that it is also a business which can be made to take the time of the quickest, smartest and healthiest man alive, and reward him a hundredfold.

As a "bit of history" which has a point to it may be interesting, I will give a few facts in regard to the commencement of this plant, which is now the most profitable one in this country where eggs for table use only are sought. Six years ago the farm was bought and dairying began. Capital was scarce and the buildings poor. The profits the first year were not enough to warrant expenditure; and how were the cows to be kept warm? Eighteen Plymouth Rocks had wandered at their own sweet will, ruining the garden and the owner's patience. He told the wife that the next season they should be confined or sold. An earnest consultation with her resulted

in their being retained and confined to a house and yard ; and a record of the eggs sold and food consumed showed a profit of 75 cents per hen. Becoming satisfied that White Leghorns would give him better results, he secured good specimens of that breed and began breeding them systematically for increased egg-production, until he has now 600 layers. Mr. Wyckoff cares little for fancy poultry. He is in the business for the dollars, and the following record shows they are there :

Hens, average number	600
Eggs each, average	168
Price per doz., average	21½ cents.
Eggs, net	\$1,800 00
Stock sold	70 00
Manure, at 20 cents per bushel.....	270 00
	<hr/>
	\$2,140 00
Cost of feed.....	\$ 660 00
Labor, 12 months at \$30.....	360 00
Interest, 5 per cent. on \$1,000	50 00
Net profit.....	1,070 00
	<hr/>
	\$2,140 00

A business that pays \$30 a month and 105 per cent. interest on the investment can not be called a side issue. There is no "patent" on the means to success. Only the carefulness, regularity and thought necessary for success in other branches are required. Mr. Wyckoff is quiet in manner, and a stranger who wished to go through the buildings would be invited to discard any red scarf or other bright-colored clothing, and requested to move very carefully. Why ? It has been proved that any unusual excitement affects the number of eggs laid the next day—a loss of 25 eggs at three cents each is too much. He is also a close observer, frequently weighing some of the flock, and noting their condition ; it being essential that the hen shall be kept in the "pink of condition" for the highest profit. Everything is kept clean, and all possible wants of the hen are regularly supplied, so that she will not be delayed by want of any egg-element. Due regard to sanitary conditions, proper

food and drink, combined with regularity and common sense, are his remedies for, or, rather, preventives of, disease of all kinds. He rarely has a sick hen, and raises a large percentage of his chickens. In incubators a larger percentage of healthy chickens are hatched than would be hatched by hens, and in brooders, where they are kept perfectly free from vermin and gapes, exposure to changes of temperature, accidents and unsuitable food, they grow better than in the care of hens.

The houses are six in number, and have a partition through the center, each end being sufficient for 50 hens. Long yards the width of the building are attached to the house on both sides, thus giving one yard for each flock. The hens are never let out of the house and yards, and are confined to the house when cold fall rains begin. Mr. Wyckoff stated that they had never seen snow. A cold hen never lays; and "hemlock lumber is cheaper than food." There will always be a falling off in the eggs in cold weather, if the hens get their feet wet. The hen herself is an important factor, and considerable attention has been given to the breeding of a producing type, the result being to discard the standard first-premium style.

One hundred pullets, hatched at one time and raised together, were placed in one house, and when one laid she was taken out. This was continued until there were 50 in each house. A critical examination showed that nearly all that were laying were of a certain type, while those that were still unproductive were of another type—a longer-legged, ungainly, slim-bodied hen, that spends her time looking for something to get scared at. A record of the two flocks showed a difference of 20 per cent in the number of eggs laid. No. 1 kept laying until nearly denuded of feathers, and after moulting, began laying quicker than No. 2. A short-legged, deep-bodied, full-breasted, wedge-shaped, large-combed hen, with a quiet disposition, has capacity to consume large quantities of food, and return eggs instead of noise and flutter. Mr Wyckoff is confident that his flock, grown from selected mothers, will average 200 eggs each for 1891. The 20 per cent. advance already obtained makes a

difference of one dollar each in the two flocks. There are "families" of butter-cows among the Jerseys, and some day there will be "egg-hens" among the already famous Leghorns. One of these improved hens placed in the hands of a person ignorant of feeding-principles would be compelled to descend to a level with the rest of the flock from a lack of well-balanced rations.

The egg-shell is largely carbonate and phosphate of lime. The hen can not manufacture lime and albumen from fat or starchy food, which is chiefly valuable for the warmth it furnishes : hence corn is a poor food, while milk, meat and shell are very essential for egg-production. When the hens are laying large quantities of eggs the shell-boxes will soon be emptied, but they are scarcely touched at other times. Some prominent writers have written much against the expense of oyster, clam and sea-shell, claiming that they only serve the purpose of "grit or grinders," which can be furnished much cheaper, and that the lime in the egg-shell comes from other sources ; but when the attendant who cleans the eggs can tell by the number of eggs brought in and the thinness of the shell that the boxes are empty, without going to look, it seems as if these writers must be mistaken. Eggs differ in quality and appearance in accordance with the nature of the food. Cotton-seed meal in excess gives an egg a week-old taste that is disgusting. Onions give a rank taste. Too much clover-hay and a bad-colored lot of sea-shells spoil the beautiful white of the egg-shells. Wealthy city people have nothing to do but cultivate a critical appetite, and are slaves to it. The guaranteed fresh, large, rich, white and clean eggs of this hennery are now selling for 60 cents per dozen in the city. Candy-makers are making trials of them for use in the making of the finest candies. The fowls are fed on green food every day in the year—one bushel of beets per day, sliced in winter, and green grass in spring ; in summer Swiss chard is good, the leaves growing again when broken. All refuse cabbage, and other vegetable matter that is not decayed, is used. One

bushel of green-cured clover-hay is cut very fine and cooked. A mixture of the feeding ration is mixed with this, boiling water being used if no milk can be obtained. At one time much larger quantities of clover-hay were used, which largely reduced the cost of feed per day, but it largely reduced the egg-product and was abandoned. It is too bulky, and the hen cannot eat enough of it to supply nutriment for heavy egg-production. Charcoal contains no nourishment, but prevents fermentation, or bad effects from overeating. There is no economy in keeping a pullet in such poor condition that it will be a year before she begins to lay. April-hatched pullets should be "pushed" for all they are worth, and begin laying in the fall. The hen that is laying should be crowded to the utmost capacity, and during the moulting season the growth of feathers is a great drain on the system, which requires plenty of food to keep the hen in condition, and hasten the growth, so that she can begin laying again. Excitement costs food and eggs; keep no males to worry, except in breeding-pens. A lot of young chicks were sorted over and all the males that could be distinguished were put in a pen by themselves. Unlimited amounts of corn were fed them until killed. The pullets and a few males that could not be detected at the time, were fed wheat and other nitrogenous foods. The corn-fed males, when killed, were a mass of yellow fat, and had small bones. The others were as heavy, but were all muscle, and had bones twice as large. They were in much the better condition for health and breeding purposes.

The following tables show the ration that has given the best results for egg-production for 600 hens.

1. Morning, by weight, *all they can eat* of the following mixture: One-half bran, one-fourth corn and one-fourth oat-meals mixed with hot water or milk, with one-half pint of salt, one quart of charcoal and one bushel of clover-hay cut fine; If there be no milk add 16 pounds of chopped meat and one bushel of beets cut fine.

2. Noon, whole grain by measure. One part oats, one

buckwheat and one wheat ; give one quart to 50 hens in chaff.

3. Night, the same as No. 2, all they will eat.

4. Drink, milk or pure water.

For chickens, a cake made of sour milk, salt and soda made thick with sifted feed and baked, also cracked wheat.

Mr. Wyckoff thus describes the houses he has found most satisfactory : "All my hen-houses are but one story high and 12x40 feet, with board floors and a partition in the center making two apartments of 12x20 feet. The sides and ends are two thicknesses of one-inch boards with tar-paper between. The houses are six feet high to the eaves with a shingle roof, and stand east and west, with two windows to each apartment, each containing six 10x14 lights, which give sufficient light when the houses are kept clean and whitewashed. Inside, running along the entire length of the north side of the building, is a platform 28 inches wide and 15 inches above the floor ; 15 inches above it, and running lengthwise of it, are two perches set in notches in a frame arranged every 10 feet for their support ; they can be easily lifted out and shoved back against the side of the house—an arrangement that permits the platform to be easily cleaned. A strip of board nailed to the front edge of the platform stiffens it and also prevents the droppings from being thrown off upon the floor. On the floor and immediately under the front of the platform are sections of nest-boxes : a board hinged to the front of the platform comes down to the top and even with the front of the nest-boxes ; an opening in the nest-boxes every 10 feet allows the hens to pass through under the platform and back of the nests, so that they have easy access to them and are not disturbed at any time by the attendant doing any necessary work about the house. The eggs are reached by raising the hinged board. A box containing dry road dust, a water-pan covered by a crate, and a trough for feeding the morning meal comprise the furniture. Everything upon the floor is movable and can be cleaned out at any time. Plenty of dry road-earth and cut-straw is used upon the floors, which are cleaned often."

A building 12x60 feet will give plenty of room for 100 hens, divided into three flocks, and need not cost over \$75. The yards should be long for ease in plowing, and a row of plum trees down the center will furnish shade and the finest fruit. The yards are plowed up to loosen the soil for the hens, to cultivate the trees and to keep the places clean. Preparations are being made to build more houses, and the flocks will be increased to 1,000, and what the business will become only time will reveal.

BREEDING LAYING LEGHORNS.

In response to many questions regarding his method of selecting breeding and feeding his hens in order to increase their productiveness, Mr. Wyckoff has prepared the following statement :

The subject of improving the laying qualities of hens is one that, in my opinion, has received but little attention up to the present time, considering the number of people who are more or less employed in keeping poultry. Why this is so I can not understand, unless it is because nearly all who have interested themselves in the improvement of poultry in the past, have directed their energies principally from the fancier's standpoint, simply breeding for uniformity of form, color, and general markings as laid down in the Standard of Excellence for the various breeds.

While I have been more or less interested in the keeping of poultry since a boy, it was not until about ten years ago that the opportunity was offered for me to begin keeping hens especially for the production of eggs for market. Then almost the first thing that attracted my attention in connection with the business was the fact that some of my hens were naturally far better layers than others, when all were of the same breed, and all received the same general feed, care and management. I at once attempted to profit by the observation, and selected the best layers to breed from. After trying several breeds and crosses, I settled down to the single-comb White Leghorn

as being best suited to my purpose and market. So far my labor in this direction has given me quite satisfactory results, and with the knowledge gained, I see a good prospect for still further improvement. I consider the improvement in the laying qualities in the last few years due more to the selection of the breeding stock than to any improvement in methods of care or feeding, as the latter have not changed materially during the time.

The improvement in laying qualities has been somewhat hindered by the attempt at the same time to improve the general appearance of the eggs by getting them all of a fair size, uniform in shape and color, thus increasing their market value. A hen that persists in laying a very small or ill-shaped egg is never used for breeding, no matter how good a layer she may be. My hens are always kept in confinement in flocks of about 50 in a house 12x20 feet, with a park 2x8 rods. Formerly, when such flocks averaged 150 eggs per hen yearly, I considered it a large yield; now I have several flocks that average 200 or more per year. I am quite sure that I have individual hens that lay an average of 250 eggs each per year, and that is the point for which I have started with the whole number kept—600. Whether I reach it or not is a question to be answered later.

In selecting my breeding flocks I find it necessary to exercise great care to avoid mistakes. The best time of the year for this work is when the hens generally are not laying well. Spring and early summer is not a good time because almost any hen will lay at that time; but late in summer during the moulting period, and in winter, are my times to decide which shall be selected for breeding the following spring. While I pay considerable attention to the external characteristics, the all-important thing is to *know* that the hen to be selected is laying the greater part of the year, and this can be determined only by close observation, and requires the outlay of a good deal of time and patience. The hens, as fast as selected, are placed in flocks by themselves; and a record is kept of the

number of eggs laid, to show how they compare in that respect with the general flock. I aim that in each of the breeding flocks there shall be, as nearly as possible, the same number, in order that one shall have no advantage over another in the amount of room occupied, and they are always fed and cared for exactly alike.

After I have succeeded in getting together a satisfactory flock, I find that they will answer pretty well to the following description : large-boned, rather long in leg and neck ; long on the back ; deep up and down behind, with legs set fairly well apart ; breast-bone somewhat prominent ; flesh hard, strong and muscular ; in good condition, but not fat ; comb rather above the average in size ; eyes bright and full ; disposition lively, but not scary ; more inclined to follow after and crowd about the attendant than to run and fly at his approach ; large consumers of food and always hungry when fed regularly and given a chance for exercise.

One of the greatest difficulties has been to find suitable cocks whenever I wish to introduce fresh blood, as I do every second year. My plan has been to get some one interested in the same line to mate a pen of his best layers whose records have been kept for the last year, showing their laying qualities, with the best cock to be procured for the purpose, and then select from the chicks cockerels when about six weeks old, and grow them, selecting from among the number some of the best in strength and vitality. As I find that a good layer is always a strong bird, I pay particular attention to mating with strong cocks. What I would like for this purpose would be cocks bred from a long line of ancestors of noted laying qualities. Such, however, are at present very hard to find, as nearly all breeders applied to can refer me only to the points their stock will "score" when judged by the Standard of Excellence.

In building up a strain of extra layers, while it has become a well-established fact with me that the selection of the breeding stock is of great importance, it is also a fact that feeding

and care must receive especial attention in order that the chicks shall be properly grown and built up to enable them to perform the work they are intended to do. To do this, the chick should be generously fed from birth with food suitable for the promotion of rapid and strong growth without fattening. A daily supply of green food and an opportunity for exercise must not be overlooked. I am an advocate of heavy feeding in connection with plenty of exercise, both for growing chicks and laying hens. I find also that the foods best suited for the growth of strong, bony, muscular chicks are also best suited to large egg-production, and that the eggs when used for hatching invariably hatch well. I never find it necessary to provide any special diet during the moulting period, as a naturally strong and vigorous hen that has been properly fed and cared for during the year previous, will moult quickly and safely, and I can furnish positive proof that many such birds will do considerable singing and lay some eggs during the time. I want none of the so-called patent egg-foods, condition-powders or drugs of any kind; but plenty of good, clean, sound grain, such as oats, wheat, barley, corn and buckwheat, using largely of the first two named. A mixture of ground oats and corn, equal weights, with their weight of bran added and the whole moistened with skim-milk, makes up the morning meal, when the hens are always hungry and are allowed all they will eat up clean in 15 or 20 minutes. If any of the food remains in the trough at the end of that time it is taken away at once. Whole grain is fed at noon and night in litter, so that they must exercise to get it; yet care is taken to see that they get enough to satisfy them before going upon their perches at night. Before feeding the grain at noon, a feed of green food is given, which is greatly relished. Green clover cut fine and kale supply this want in summer, and cabbage, beets and turnips in winter. A little skim-milk is given for drink in the forepart of the day, with a supply of good, pure, clean water the rest of the time. No musty or impure food of any kind is ever given, for the reason that it is be-

lieved to be injurious to the health of the fowls and to impart a bad flavor to the eggs.

A great deal has been said and written of late in favor of feeding clover-hay to laying hens, with the claim for it that it will increase the egg-yield and greatly cheapen the cost of feeding. While I do not dispute the claim that clover-hay contains, to a large extent, the elements necessary for the construction of the egg, my experience in feeding it for the last three years is that it will never take a large part in feeding, especially where a large production of eggs is desired, because, even when chopped fine and scalded, it is too bulky to allow hens to eat and assimilate enough of it to keep up even an ordinary yield of eggs. I consider it valuable as hen-food only when fed to hens that have become fat and inactive from overfeeding and lack of exercise ; then feeding it in part for the grain lightens the food without reducing the bulk and therefore improves the general tone and health of the fowls. I find that with my hens when in good laying condition and getting a daily feed of green or succulent food, I can not afford to crowd out the heavier feed of grain for the purpose of compelling them to eat so bulky a food as clover-hay ; especially is this so during the season when they are doing their heaviest laying, at which time I have abandoned the feeding of it altogether ; but I feed it lightly during moulting and when they are closely confined in winter. My object in feeding green food is to improve and keep in order the digestive organs, thereby increasing their power to assimilate more of the heavier foods which are necessary for a large egg-yield.

Although my experience of late has been principally with the Leghorns, I see no reason why the heavy breeds should not be fed and handled in the same way. Any hen, large or small, that has to work for a good portion of her food will keep in good health and not get overfed, unless the food is too heavy and fattening, or the hen a poor layer. My experience in crossing has convinced me that there is nothing to be gained in promoting egg-production in that direction ; while a first

cross seemed to be an advantage, by going further all was lost. I have certainly had better results from the constant use of one breed. I find that the keeping of dairy-cows for butter-production goes well with the egg-business, and I know of no way to dispose of skim-milk to better advantage than by feeding it to laying hens. The farm crops raised are selected with a view to providing food for both hens and cows, the rotation being, corn, oats, wheat and clover. No garden crops are raised except for family use and to supply succulent food for the hens and cows in winter. Each hen-park contains a row of plum trees, which provide the hens with shade and are so situated that they make a rapid growth and bear fruit of a fine quality. The plowing of the ground necessary to keep it in good condition for the hens seems to give them the needed cultivation ; while the droppings from the hens, in addition to a yearly dressing of bone and potash, provide fertility.

THE ROASTER AND THE BROILER.

CHAPTER VIII.

THE ROASTER.

JAMES RANKIN.

EVERY one who has attempted to grow beef, pork or poultry for market knows that during the latter half of the work flesh is put on much more easily and at less cost than at first when the creatures are young; especially is this the case with poultry. When chicks arrive at the broiler age, when all risks from early mortality is over, the chicks naturally take less exercise and are more quiet in their habits and their food should be of a more carbonaceous nature. The flesh can be put on at a much less cost to the grower than in the earlier stage of growth.

Discrimination must be used in this as in other things, and advantage must be taken of the market. For instance, during September, October and November larger quantities of heavy poultry are rushed into the market from all parts of the country and Canada—enough to meet the demand and produce a large surplus besides. This surplus, which can be rated at hundreds of tons, is placed in cold-storage for future demand during the winter and early spring months. As there are very few small chicks in this vast accumulation, the demand for broilers is naturally great and that for roasters correspondingly small, until about the first of May, when the iced-poultry is about exhausted and the demand for roasters begins. Growers anxious to take advantage of the market before it falls force everything in that will weigh a pound and a half; consequently by the first of June there are no roasters to be had

and the market is full of broilers ; and the price, which during the winter and early spring months had been from 10 to 15 cents per pound in favor of broilers, is gradually changed, until by the first or middle of June the discrepancy is in favor of roasters. During the past June the price of roasters has varied from 40 to 44 cents in the Boston market ; while that of broilers has been from 30 to 35 cents, having sunk even as low as 25 cents, and this discrepancy was greater still before the close of July.

This is a state of things that the poultry-grower should take advantage of and cater for. He should arrange to get out his chicks during January, force them for all they are worth, and so be able to put them on the market during May and June at the weight of from five to seven pounds each. The Leghorn tribe and all the small varieties are worse than useless, as they never attain the required weight. I have tried all the different varieties of the larger breeds, and find that the Light Brahma will take on more flesh in a given time than any other breed, unless it is the Dark Brahma : but the color of their feathers is a little against them. The greatest trouble the grower will have to contend with at first is to obtain an abundant supply of good, fertile eggs in the dead of winter ; and what he must aim at eventually is to produce his own eggs, as he can do it not only much cheaper than he can buy them, but he can in a great measure control their fertility, which is of greater importance than all the rest. This great question of the fertility of the eggs in the dead of winter when fowls are necessarily confined, is rather an obscure one to most people and would require a long chapter of itself ; but after years of experiment I am more than ever satisfied that it is under control. Most poultry-growers know from bitter experience that the welfare, thrift and precocity, as well as the mortality of their chicks, depend largely upon the condition in which they are introduced into the world. With some machines no amount of petting and coaxing can induce the chicks to live : with others they seem to be bound to live at all hazards until the knife ends

their days. When things are conducted favorably, a loss of one to two per cent. is all that is necessary in growing chicks.

It is well for all to understand that chicks can be forced to a greater weight in a given time when hatched and grown artificially than can possibly be done under hens. I was never able in a 30 years' experience with hens, to grow chicks at four months old as I am now doing artificially ; for instance, on April 10 last, I put 300 chicks right from the incubator into two of my outdoor brooders. The loss among these was less than one per cent. up to 10 weeks old, when quite a large number tipped the scales at four pounds each. In a previous hatch I put 20 pairs on the market when 11 weeks old, quite a number of which weighed five pounds each when killed, and I must say they were the heaviest chicks of their age that I ever grew. It was a special test with me to make the conditions as favorable as possible to see how heavy a Brahma chick could be forced to weigh at a given time. For the first six weeks the food given was largely nitrogenous, after which I gradually fed more cornmeal together with raw ground bone. I always start my chicks with bread-crumbs, three parts, into which I mix one part of infertile eggs boiled hard and chopped fine. I do not feed any more than that, as an exclusive feed of eggs will surely give them the diarrhœa, like one of meat. I also feed granulated oatmeal two or three times a day, and after the first three days, two parts of cornmeal and one part of bran should be substituted for the bread-crumbs and egg. It is well to scald for a while. Keep water by them constantly. Care should be taken to feed no more than the chicks will eat clean, as food kept constantly by them will always get more or less mixed up with their excrement and an abundance will sooner or later clog them. It is well to scatter a little sharp sand upon their feeding-troughs so that they will naturally eat a little with their food until they are old enough to supply their own wants.

If brooders are used, great care should be taken not to over-heat them, as chicks when uncomfortable will usually crowd

and if too warm the inside ones will be in a sorry plight before morning. It is necessary to examine them just before dark when large numbers of the chicks are put together, and gently push them apart with the hand for a week or so until they get over the tendency to crowd. Be sure to keep your brooders clean and well disinfected. A great deal depends upon this, and if the chicks are necessarily confined during cold and snowy weather keep plenty of green stuff by them in the shape of green rye or refuse cabbage chopped fine; in fact, no kinds of vegetables come amiss. It is a good rule to keep the chicks a little hungry when confined, and not to feed too highly of concentrated foods, as the youngsters are apt to get weak in the legs. They can be put upon the market at a weight of from four to six pounds.

I usually watch my opportunity and sell during a scarcity. A good Brahma chick when four months old should dress from five to six pounds, and if well-fattened and nicely dressed will readily command from 20 to 40 cents per pound. During one week in June last season roasters sold quickly at 44 cents per pound in Boston. Now, as these chicks can be grown for from five to six cents per pound, the margin of profit is large. Too much cannot be said in favor of dressing chicks neatly and putting them up in clean, tasty packages and assorting them carefully, as one or two inferior chicks in a package will oftentimes cut the price of the whole.

THE BROILER.

As all the world should know, a "broiler" is a young chicken that has been pushed and petted through the eight or ten weeks of its life till it is fat and fit for the frying-pan. So much has been written in detail about the business of hatching and feeding broilers, that we merely give here the following brief synopsis of the business, which has been prepared by Mr. P. H. Jacobs. If one is going into the business extensively, he should not be satisfied with what he can *read on*.

the subject, but should go to Hammonton, N. J., or some other point where the business has concentrated, and make a thorough study of it.

1. Any kind of an incubator that will permit of keeping eggs at the proper temperature will hatch them, if attention is given it by the operator, observing, of course the proper conditions of moisture.

2. The temperature for hatching eggs is 103 degrees, and the temperature for a brooder should not be under 90 degrees the first two weeks, nor under 80 degrees until the chicks are six weeks old.

3. No food is required for the first 24 (or even 36) hours. Then keep granulated (pinhead) oatmeal in a little trough always within their reach, giving soaked bread and milk three times a day, until they are three days old, when they may be given a little chopped meat once a day.

4. An excellent bread may be made for them by combining equal parts of ground oats, cornmeal, middlings, and ground meat—baking the mixture in an oven. Stale bread of any kind, crackers, or other cereal foods are also excellent.

5. As soon as the chicks are able to eat wheat and cracked corn they will require but little labor in feed, as it will be necessary to give them only a morning and night meal of soft food. The soft food may consist of cornmeal, ground oats and ground meat, equal parts, scalded; but any variety, such as cooked potatoes or turnips, chopped cabbage or onions, milk or anything they will eat, may be given with the soft food at noon.

6. Warmth is the most essential requisite in raising chicks. They must never become chilled at any time.

7. When the chicks crowd under the brooder or under the hen, it indicates that they do not get sufficient warmth, and when they are found dead, without sufficient cause, under the brooder in the morning, it indicates insufficient heat; the deaths occur from crowding.

8. If too much warmth is given, the chicks will sleep along

the edges of the brooder. It is better to give too much than not enough.

9. If the chicks have bowel disease, and become "clogged," they have at some time been chilled. If bowel disease is more prevalent among those chicks which are shooting out feathers very rapidly, it indicates that a meal of chopped raw meat is needed once a day, as the debility occurs from the lack of sufficient nitrogenous matter to produce the feathers. The young of all birds require animal food until they are feathered, and chicks are no exception.

10. Give water in vessels so contrived that the chicks can wet no portion of the body. Dampness is fatal. Warm water should be used at all times if possible.

11. Hard-boiled eggs will cause bowel disease; but a raw egg mixed with the food for 25 chicks, three times a week, will invigorate them.

12. Adult fowls and chicks should never be in the same building, as lice always come from the adults to the chicks.

13. Never allow chicks in the open air in damp weather until they are a month old, and not then unless they are strong and active.

14. Dorkings, Leghorns, Games and Houdans require more animal food when very young than Brahmas, Cochins, Plymouth Rocks and Wyandottes, and they begin to feather earlier.

15. The chicks that appear almost naked until well grown, are usually easy to raise, as they do not feather fast enough to become debilitated.

16. The cross of Wyandotte or Plymouth Rock cock with Brahma and Cochin hens, produce hardy chicks that grow rapidly and large; but the most breast meat and plumpest carcasses are produced by crossing Dorking, Game or Leghorn cocks with hens of any of the larger breeds.

17. Contrary to claims against the cross, one of the best crosses for broilers is the Brown Leghorn with the Brahma or Cochin. The carcass has a plump breast, and yellow legs

and skin. Such chicks, however, should be sold for small-sized broilers, as the combs appear too soon to permit their being sold older.

18. Broilers are sold entire, the feathers only being removed. They must be dry-picked, the pin-feathers removed, and the skin free from bruises or rents. Pack in boxes or barrels and ship by express. They can not be sent to market alive in such weather, as they would perish.

19. The cost per pound of broiler, for food only, is five cents; but the cost of the eggs for hatching, fuel and warmth, labor and interest on investment must be considered in the cost.

20. If well fed the chicks will double their weight every ten days until they are 40 days old. If forced, they will weigh a pound each when six weeks old, and two pounds at ten weeks.

21. The space used on the broiler-farms under shelter is $5 \times 7\frac{1}{2}$ feet, with yards 15×16 feet for 100 chicks. They never leave this space until they are sent to market. The brooder is one yard square. As the brooder-house is warmed by the heat that escapes from the brooders, if the chicks grow too large for the brooders (by which time they are usually well-fattened) they do not all go under the brooder.

22. The first broilers usually come to market about February 1, and they should weigh not over a pound. Then follow those not over $1\frac{1}{4}$ pounds in March. April and May demand sizes not over $1\frac{1}{2}$ pounds. The prices vary from 25 to 60 cents, and occasionally more, per pound, being highest in April and May.

23. The best market is New York city early in the season, but Boston prices equal those of New York, later. Chicago prices equal those of New York, but the demand is a little later than in New York for the early lots.

24. Sandy soils that can not be devoted profitably to agriculture, make the best location for the broiler business, as such soils dry immediately after rain, while the water dissolves and carries down the filth, thus preventing cholera and gapes.

25. Whenever the chicks droop, though receiving the best of care, look on their heads and necks for the long body lice, and if they are found, rub a few drops of lard on the heads and throats, but do not grease the bodies.

POULTRY AS INSECTICIDES.

CHAPTER IX.

POULTRY-KEEPING IN ORCHARDS.

J. S. WOODWARD.

WHILE hogs or sheep kept in an orchard will destroy many insects and greatly help to keep them in check, they do so only incidentally, and for the sake of getting the infested fruit in which the insects may be lodged. Not so with an old hen and a brood of young chicks or ducks. They are ever on the alert, no insect escapes their quick eyes, and they eat the "varmint" for its own sake, and no insect but is agreeable to their taste. One such family will destroy more insects than a hundred sheep or double that number of swine.

We have for several years made use of this means, and we find the fruit of that part of the orchard in which they are kept very much fairer and freer from insects than that produced on the other parts. So much have we been impressed with this fact that we are extending the system to the whole orchard. In order to have them all over the orchard we have constructed a number of high, cheap and warm houses, that are 8x12 feet, eight feet high on one side and five on the other. The sides and ends are made of matched lumber nailed to sills and plates of 4x4 stuff. The roof is made of strips on which shingles are laid. The whole of the inside is double-sheeted with tarred paper—the under part of the roof as well as the sides. There is a large window in the south side and a door is placed in one end. Each house is provided with roosts and nests and made in every way as comfortable as possible.

Twenty-five pullets are placed in each very early in the spring ; or they may be wintered there, with a cock if breeding is desired. As soon as one becomes broody, she is furnished with a clutch of eggs, either hen's or duck's, as desired, and when they are hatched she is cooped in or near the house until the younglings are a couple of weeks old, more or less, when they are allowed to run at large. Each night, at egg-gathering time, each lot of old fowls are fed a proper allowance of whole corn. This insures their "coming home to roost," and makes them so contented and happy that they never mix, even where the houses are not more than 20 rods apart. Of course, the chicks when young are fed oftener and on suitable food.

All this takes but a small amount of time each day ; while the results are very satisfactory in more ways than one. We get many hundreds of dozens of eggs while the price is comparatively high. We raise from one to several tons of poultry, which, by watching the markets, we sell at good prices, and which in reality have already paid a fine profit beyond the cost of raising by the decrease of insects and the increased fairness and value of the apples.

By selecting the earliest-hatched pullets for wintering-over, we always have a large yield of eggs to sell during the scarcity and consequent high prices of winter. While we make use of all the means known to us for reducing the number and depredations of insects, we know of no means so perfectly and cheaply effectual as the keeping of poultry in the orchards.

After trying very many of the newer breeds of fowls at the farm, we have now fairly settled down to the conviction that none is in all respects equal to the Plymouth Rocks. They combine more of the following good qualities than any other breed we have ever tried—hardiness, early maturity, quietness, abundance of good-sized eggs, even in winter, and size of carcass. We think this emphatically a general-purpose fowl.

We select each year about 25 to 30 hens, in every way models, and with these we mate a cockerel as nearly perfect as

we can find and remote as possible in blood. In this way we have secured fowls as like as peas, the hens averaging about eight pounds and the cocks nearly 12.

Ducks Fattening on Potato-Bugs.—It has frequently been asserted that ducks and geese will eat potato-beetles. We have never been able to get them to do so, but it seems that others have been smarter. E. H. Kern, Mankato, Kansas, writes to *Insect Life* as follows: "Several seasons ago my potato-field was almost ruined because I could not use Paris green, as my stock was in danger from it. A large pond of water attracted about 20 of my neighbor's ducks to its shore. I never did fancy ducks very much, and I told him so. He said he would give them to me if I would care for them, as he could not keep them at home. The next morning I went down to the pond at sunrise to try to drive said ducks into a pen. I saw a very curious sight. Headed by an old drake, the 20 ducks were waddling off in a bee-line for my potato-field. I crawled into some bushes and awaited developments. As they came to the end of the rows they seemed to deploy right and left, and such a shoveling in of bugs I never beheld. They meant business, and for fully one-half hour did they continue, until every duck was filled up to its bill with bugs. Then they went for that pond, and I went for their owner and paid him \$1 for the entire bunch—that being all he would accept. When I returned, every duck seemed to be trying to outdo its fellows in noise. This expedition was repeated about 4 p. m., and kept up until every bug went under. I have tried these ducks and others since, and find they all relish and seem to get fat on potato-bugs."

CHICKENS IN THE ONION-PATCH.

J. J. H. GREGORY.

As is well known, the onion-maggot is hatched from eggs laid in the young onion at the surface of the ground, by an insect known among gardeners as the "onion-fly." This is one

of the most dreaded enemies of the onion-crop, and one whose extensive ravages have driven onion-cultivation from many localities in our northern states. Thick planting, with the expectation that after the fly pest has helped himself to a portion of the young plants there may be left a proportion sufficient for a good crop, has not proved to be a remedy, for the habit of the fly is generally to deposit her eggs in every onion until they are exhausted. The result, therefore, of the thick planting, after the maggot has done its work, is to leave the beds with rows that have alternate patches of utter blank and extra-thick spaces: on the latter the plants are too near together to make onions of fair market-size possible. The general practice where beds are badly infested with the maggot has been to give up the location and transfer the raising of the crop to some other portion of the farm. As land suitable for raising onions—in the quality of the soil, freedom from stones and level character—is not very common on the average New England farm, it is oftentimes the case that the tiny insect conquers and the crop is driven from the farm. Having this trouble on my own farm, while preparing to abandon one of my beds, located on excellent onion-land, and to start it in a new location, I heard an old market-gardener state that he had had no serious trouble from the maggot since he had tried the hen-and-chickens remedy. On being asked to explain, he stated that it was his practice to confine a hen with chickens on each acre of his onion-ground, soon after the plants appeared above the ground; the hen to be confined in a small coop which allowed the chickens easy access in and out. The chickens, he stated, soon got track of the fly and devoured it while it was depositing its eggs. Last season I tried the experiment on my own farms, locating three broods on about as many acres, putting in one in about the middle of each. As to the result, though I am not able to report with the accuracy of a scientific expert, testifying only to what I really saw, yet, as a matter of fact, on all three of the acres my onions are much less injured than they had been the year previous,

and I am so strongly inclined to award the credit to the feathered hunters, that I shall again give them watch and ward over my onions.

CHICKS AS GARDEN ASSISTANTS.

FRED GRUNDY.

When hoeing or raking in the garden I am constantly turning up numerous worms, grubs, bugs and beetles of various sizes, kinds and colors, and if I stopped to slay each and every one of them I should make very little progress. If I passed them gently by they would continue to gnaw, uproot and destroy my favorite vegetables, wax fat and keep my wrath at the boiling-point. How to compass their destruction expeditiously and cheaply was a question I pondered much. But I have solved it at last, and now not a grub, bug or worm that my hoe or rake uncovers has time to be astonished before, presto! he finds himself among the rocks and broken crockery in the interior of a healthy chick, where he is soon reduced to pulp.

I never want less than five fair-sized chicks nor more than a dozen small ones with me. If there are not enough they get full too quickly and retire. If there are too many, they get in the way and some of them meet with accidental destruction. It is amusing in the extreme to see half a dozen or so of them dancing about on either side watching the progress of my implement, and when a choice morsel is exposed pitching over each other in their eagerness to get it. Occasionally, one becomes too fresh and gets knocked over, but they soon learn about how near it is safe to venture. One lot I had in the early spring always followed along behind, but the little mob I have now keep constantly circling around me. All were hatched in an incubator and reared in a brooder, and are sold as soon as they weigh two and one-half or three pounds. Those hatched by hen-power must be taken from the hen as soon as they are hatched and reared in a brooder, or they are no good as grub-gobblers. They are afraid to leave their ma! and you don't want her along to work ruination.

I have done a good deal of hoeing and raking in the garden and among the strawberries, etc., this season, and of all the thousands of grubs and worms I turned up I am satisfied not half a dozen escaped the vigilant eyes and nimble beaks of my chicks. They have also kept the lawn, flower-beds and garden entirely free from grasshoppers, while there are thousands among the clover not 300 yards away. About 20 are enough to have around, and as soon as they begin to scratch hard they should be sold or shut up and another lot of small ones brought in.

THE HEN'S HABITATION.

CHAPTER X.

A COLD COUNTRY HOUSE.

ARTHUR D. WARNER.

A GENERAL view of our yards is shown on next page. A poultry-farm of any considerable extent needs power of some kind. Wind is the cheapest. It is a great wonder that farmers do not make more use of it for other purposes than pumping. For centuries the wind has driven the commerce of the world from port to port, but on land most of this vast force is allowed to go to waste. Heavy loads are hauled to the mill and back, and the back-breaking process of shelling corn and cutting feed by hand still goes on. The Monitor wind-mill that I use is by no means a plaything. It is a practical "engine" in every sense of the term. By attaching a long belt to a mandrel outdoors, a winter's supply of wood can be sawed in short order. Bone-mill, corn-sheller and feed-cutter are instantly attached. Grain is cracked to any size for chickens, or ground fine at the rate of 10 bushels per hour during a strong wind. Some custom grinding is done. Buzz-saw and lathe are used in making coops, nest-eggs, etc.

Hens Appreciate Good Homes.—Good results from fowls cannot be expected unless they are surrounded by the conditions of warmth, good housing, fresh water and proper feed, that are essential to success in dairying or sheep husbandry. In preparing for the business it will pay to put up a hen-house that equals the best cattle or horse-barn in stability and comfort. Build to last a lifetime. Roof with good shingles. Use matched siding when possible. Line the interior with

VIEW OF ARTHUR D. WARNER'S YARDS.

some good material. The added warmth will largely increase the contents of the egg-basket. I use tarred paper or felt for this; it is very durable, and is a preventive of vermin. By all means make a platform just under the roosts, and clean it

off frequently. Several barrels of valuable fertilizer will be saved during the year, and as the floor will be always clean the capacity of the house will be about doubled. Running-over piles of droppings is a fruitful source of disease in poultry. Nowhere except in the dwelling-house is strict cleanliness more essential than in the hen-houses. In building I use large stones at the corners and under center posts, then lay a sort of wall between them under the sills. A load or two of small stones are thrown inside, and covered with gravel or coal-ashes. The house is banked up with dirt from a trench dug all around it. Three of my houses are 9x24 feet, and accommodate 100 fowls with unrestricted range. Two others, 8x15 feet, are divided into three compartments each, and open into separate yards. Fifteen hens are kept in each for breeding purposes.

The buildings, made 9x24 feet, should front towards the south. Use for the frame 2x4 hemlock scantlings if they can be obtained. Get six large stones, four for the corners and two to be placed 12 feet from the corners on each side. Lay two 12-foot scantlings end to end for each side. Upon these on the ends and in the middle lay the three nine-foot cross-pieces and spike all together. Level carefully. Set up the six uprights upon the extremities of the cross-pieces, the front ones being four feet eight inches long, those at the back, six feet eight inches. Then put on the plates (12 feet 2x4 scantlings). Two pieces should be set in the frame at the back about three feet eight inches above the sill to help support the platform and for nailing the siding to them. Then tack strips of tarred paper up and down outside the frame at the back, and nail on the siding over it. There are nine sets of rafters three feet apart. The scantlings are cut seven feet four inches and three feet 11½ inches, the longest measure. Old fence-boards can be used for the piece which binds them together, forming a truss. The rafters can all be framed before they are set up, if one set is put together for a pattern.

Now set up the rafters, put on tarred paper crosswise, then

the roof-boards. The ends are next sided, the tarred paper having been first applied as before. Next comes shingling; the front is finished last. Four windows, $3 \times 3\frac{1}{2}$, are sufficient. A long scantling set in the frame forms the window-sill and pieces of the same set up make a frame for the window, which extends to the plate. The door-frame is five feet wide and three feet eight inches high. A frame of 2×4 scantling is made in the building as for a stationary table or counter, and 1-inch rough hemlock boards are nailed on lengthwise of the building.

Crosswise of the building, about eight inches apart, are 34 roost-poles of 2×2 stuff with the corners shaved off. The poles are four feet long and 14 inches above the platform.

Eighteen nests, 12 inches high and deep, and 14 inches wide,

are placed under the front of the platform. The hens go in from the back side of a hole 6×7 inches. A board shelf is put up, on which they can walk along to the nests, and a short ladder reaches to the ground. The sides and bottom of the nests are of single boards 12 inches wide, with board divisions; but the front board is slit into three pieces of

FIG. A.

equal width; the middle one being hinged at the bottom and fastened with a button at the top, turns down, opening nine

nests at a time. The ladders upon which the hens climb to the roosts are set out so that the turning down of the above pieces may not be interfered with. These are merely boards with cleats nailed across them. If a ventilator is put in it should open near the ground.

Fig. A is a cross-section of the building. Fig. B is a cross-section of a cheap three-section breeding-pen house (requiring about 400 feet of lumber.)

FIG. B.

Fig. C shows the construction of the nests and roosts, Fig. D

FIG. C.

is a convenient arrangement for six breeding-pens with yards (mine are $26\frac{2}{3} \times 70$ feet). Fig. E is a wooden stationary feed-box. Fig. F is a water-trough of galvanized iron, which any tinner can make. Fig. G

is a long box with slats across the top—a very convenient feeding-box. Fig. H is a perpetual feeding-box for use in fattening fowls, feeding dry bran or ground shells, bone, grit, etc.

BILL OF LUMBER, ETC., FOR HEN-HOUSE.

400 feet matched pine, at \$18 per M.	\$7 20
120 feet hemlock boards, \$13 M	1 50
230 feet 2x4 hemlock, at \$13 M	3 00
Shingles	6 75
4 windows, at \$1.25	5 00
100 pounds tarred paper	2 50
Nails, hinges, etc.	2 00
Total	\$27 95

No estimate is made for roof-boards, as old fence-boards were utilized. One dollar's worth of oil and Venetian red should paint the building twice over.

FIG. D.

GLASS IN THE HEN-HOUSE.

As the practice of keeping the hens housed during the entire winter becomes more general, the question of where to put the glass, and how much is needed to secure necessary warmth, becomes of great importance. Many poultry-keepers put all the glass in the south side of the house. Others want it on the east and west sides, thus securing, as they claim, less intense heat but a longer continuance of it during the day. The matter was submitted to a number of leading poultry-authorities, and here follows a synopsis of their views. P. H. Jacobs says that most poultry-men at Hammonton face their houses to the southeast. For a house 10x10 a sash 3x6 is about correct. To

avoid losing heat at night by radiation, some use a burlap curtain which is lowered at night. With glass on the south alone the hens miss the earliest sun, which is what they need.

Fig. 5

Fig. 7

FIG. G.

FIG. E. catch the morning sun.

James Rankin thinks a well-arranged poultry-house should face a little to the east of south so that the morning sun in winter will strike upon the glass. A house thus located will always be warm enough in the afternoon with the oblique

rays of the sun striking in. Too much glass is worse than none at all, as it means extremes of heat and cold. Glass will let out as much heat during the night as it will admit during the day. People generally put by far too much glass in their poultry-houses.

C. S. Cooper says: "Were I to build a new house for poultry I would place the glass in the east and west ends thereof.

Fig. 6

FIG. F.

12 in.

Fig. 8

FIG. H.

In regard to extreme cold at night, I cannot conceive the benefit to be derived from glass, whether it be east, west, north or south side. The air is equally cold in all directions during the night. The same exposure in either direction, must admit the same amount of frost."

Henry Hales says : " I have a number of houses of various designs—two with west windows ; but these west windows let in more cold or rather let out more warmth than windows on the other sides. A very cold northwest wind penetrates these west windows badly and I never have them in houses in which I can as well dispense with them. The warmest houses in winter are those with glass on the east and south sides only, with no opening on the west and north."

A MOVABLE CHICKEN-COOP.

When the chickens are large enough to leave the brooder and run outdoors, a coop or house is needed where they may be safe from rats and other vermin, eat their food undisturbed and be warmly sheltered at night. Fred Grundy thus describes a coop that he has found very successful :

This coop is 24 inches wide by 30 inches long, and 12 inches high at the sides. It has a drop-door in front which in the sketch (Fig. 90) is shown fastened up with a leather loop. There is a three-inch hole near the roof at each end, for ventilation. Cover them with wire-cloth to keep out rats and vermin, and in cold weather close one of them with the sliding-cover shown in the sketch. One side of the roof is hung on hinges so that it can be raised when the coop is to be cleaned out. The apex of the roof is covered with a strip of waterproof cloth to shed rain. The rear end is supported on wheels six inches in diameter, cut from two-inch oak stuff. The wheels, with their connecting axle, raise the floor of the coop four inches above the ground, keeping it dry and preventing the drowning of the chicks in very heavy showers when water stands two or three inches deep on level ground, and also making it easy to transfer from place to place. The protecting

run is the same width as the coop and 30 or 40 inches long, and is made of fence-lath or similar material. It has a hinged cover, as shown in the sketch. Food and water for the chicks are placed within this run and are out of the reach of other fowls. A coop of the size shown in the sketch is large enough for 25 chicks with a hen, or 50 without, and it can be moved about the garden almost as easily as a wheelbarrow. It keeps

FIG. 90.

the chicks dry, comfortable and healthy, and is easily cleaned out. The coop should never be moved far at any one time. Always at night get 25 or 30 chicks in it, with or without a hen, draw it close to your cabbage and radish-beds, and the little fellows will make it very uncomfortable for the pestiferous flea that destroys these plants by wholesale. I tried this plan last year for the first time and it worked like a charm. I did not lose over a dozen out of 20,000 cabbage-plants, and for the first time in years had more radishes than we could eat. When the chicks are taken out of my brooder they are put into this coop, the floor bedded an inch deep with short straw or dry leaves, and the front of the run closed so that they can not get out. After four or five days the run is opened and they go where they please, but they are always fed inside the run. When a storm is imminent I take a little

food and call them into the run, close it up, then drive them into the coop and drop the door. It can all be done in half a minute, while, if they were in charge of a silly old hen, it could not be done within ten minutes. While my neighbors have sometimes lost over half their chicks in the sweeping showers that burst upon us without any warning, I have never lost one. Bed the coop only while the chicks are small, and be sure that the bedding is short, fine stuff, and don't forget to close the door every night.

THE BEST POULTRY-HOUSE FLOOR.

In the beginning of my present poultry business and in building my first poultry-house, I believed that a floor of earth would be just the thing needed, if properly constructed and dry. I was careful to place a good drain under the foundation-walls and fill inside to a depth of two feet with stone and gravel, with a foot of dry loam on top, to be changed twice a year if necessary. The house was built at odd spells during the summer, and was thoroughly dry when the hens were put in it September 1—fifty in each apartment 12x20 feet. At first, all went well; the hens were out in the parks a good share of the time; the windows were open on warm, sunny days, and the floors kept dry and in good condition; but as winter set in with a fall of snow that remained all the season and the hens were consequently confined entirely to the house, the floors soon began to show dampness from the droppings, which condition grew continually worse until about February 1, when, in spite of my efforts to keep the floor in proper shape by using cut straw, chaff and other absorbents freely, it was far from satisfactory, being damp and sticky to a depth of five or six inches. Although dry below that, there was continually arising a strong, disagreeable odor, which I finally succeeded in checking by a free use of plaster; but the floor remained damp and grew worse until spring came, when, with warm days and open windows, it dried into a hard crust six or

eight inches deep, which it was something of a job to dig up and carry out.

The condition of the hens as to health and egg-production during the fall and forepart of winter was quite satisfactory, with a flattering prospect for the entire winter. This condition rapidly fell off, however, as the floor grew damp, and along toward spring, when they should have been laying nearly at their best, I was getting few eggs and there were many sick and ailing hens, and, in fact, I lost a number.

The conclusion that I drew from this experience was, that while an earth floor which could not conveniently be changed at least two or three times during the winter might answer for a small flock, in a house large enough to allow the dry earth of the floor to absorb all of the moisture from the droppings without becoming damp and disagreeable until spring came with its conveniences for changing it, I should have to use a solid floor with absorbents to cover it, that could be changed often to enable me to keep in proper condition so large a number in so small a space.

It seemed to me that grout or concrete would be the right thing; but as I found that I could put in a board floor somewhat cheaper, I concluded to use it. I bought a lot of cheap but sound hemlock and laid the floor, being careful to join the edges as closely as possible without planing or matching. This I kept well littered with a layer of dry earth and cut straw which was changed as often as needed, with the best results, all through the next winter, which was severe, and the hens were closely confined all of the time. So well was I pleased with this floor and the method of keeping the house dry and clean through the winter that I have not looked for a better.

I know of no real objection to grout or concrete for the purpose. Some, however, have raised the objection that a floor of that kind is always cold and disagreeable to the touch and consequently uncomfortable for the fowls confined upon it. Without having had any experience with it, I am strongly of

the opinion, however, that if kept properly covered with dry earth and litter of some sort, as all poultry-house floors should be, this objection would be entirely overcome. This being true, the facts that it is far more durable than boards, and that it is proof against rats and similar vermin, combine to make it the best as well as the cheapest in the end. There may be other objections to it of which I am not aware, and were I to adopt its use I should do so in an experimental way at first.

In building and arranging for my present poultry-business I was obliged to build cheaply or not at all. This seemed very inconvenient at the time, as it compelled me to go slow and carefully study all sides of the question; but now I look back to that time with no feeling of regret, as I am quite sure that had I been possessed of ample means I should have built too much without the necessary study to have made my building a success.—C. H. WYCKOFF.

I find boards better than earth or concrete for poultry-floors, as they can be renewed, and are easily cleaned, and are warmer. Earth floors become foul, and must be frequently renewed. Concrete floors are cold to the feet, unless well littered, but for preventing rats from entering the poultry-house they are excellent. Were it not that they provide a harboring-place for rats, boards can not be excelled.—P. H. JACOBS.

I think the best floor for a poultry-house is sand. If I could have one as I want it I would concrete or cement the bottom up to the sill and then put on four inches of quite coarse beach sand. My reason for this opinion is that fowls eat a great quantity of sand or grit, and in the winter, when they can not range at large, they always have the sand to pick. I also believe that half of the diseases of poultry are caused by their not having grit—and the best kind of grit is sand. I do not believe there would be much if any chicken cholera, if the fowls had access to it.—P. WILLIAMS.

According to our experience a floor made of good matched and planed lumber gives the best satisfaction in a hennery, as

it can be kept dry and clean more easily than any other with which we have been familiar. We always keep our floors well littered with fine straw, having as much chaff in it as possible. We see no objection to a cement or concrete floor if it can be kept equally dry and be built as cheaply.—KNAPP BROS.

POULTRY'S PLACE IN A ROTATION.

CHAPTER XI.

THIS question is frequently asked : "What farm or garden crops can I best grow in connection with poultry?" Poultry-keeping is a winter business. One can work with hens while the farm is resting. During the summer the hens rest and the soil must be made to work. As a rule, men who go largely into poultry-keeping select some special line of farming or gardening. Mr. Wyckoff, for example, has a butter-dairy. He is on a good-sized farm and grows a large share of his grain. The skim-milk, too, is fine poultry-food, the hens making a more profitable use of it than would hogs or lambs. This is a good arrangement if one has the land. It seems probable, however, that the most successful poultry-keeping will be done on smaller areas in connection with small fruit or vegetable-growing. Mr. Warner has about 20 acres. With his 600 hens he finds that asparagus and small fruits are profitable crops. Potatoes, cabbage and celery are also good because the wastes can be utilized as green food for poultry.

One of the most practically successful poultry-farms that we know of is that of Mr. A. Johnson, in New Jersey. A detailed statement of his methods will answer hundreds of questions that have been asked regarding poultry-keeping. The facts given here can be easily verified.

Mr. Johnson was a jeweler by trade. His eyes gave out and he was forced to leave the city and go to farming. He had bought a place of 18 acres a short distance from Paterson, N. J., just after the war, when prices were inflated and land was sold for its prospective value for building-lots. He ran in debt for

his place, and was therefore forced to pay off a \$3,000 mortgage out of the profits made on "depreciated prices." When first bought, the farm and house were all out of order. A shed was the only barn. There were no fences, and the only crops were wild-grass, brush, briars and weeds. At first Mr. J. worked at his trade in Newark and tried to improve his little place by proxy—that is, through the work of a hired man. This was a failure. It took all he could earn to pay expenses without paying off a cent of the mortgage. When his eyes began to fail Mr. Johnson took what seemed a desperate step. He left his trade with its sure and steady cash payments, and went to his little farm to try to make a living and save his home. He knew little about farming, and had for years been used to drawing a good salary in cash every week. He was now called upon to change his entire mode of life and to draw his salary whenever he could raise and sell produce. The farm was low and flat—strong soil, but apparently too wet and cold for anything but grass, and too level for under-drainage.

Mr. Johnson was a skilled workman. He had been trained to *think*. The first thing he did on coming to this little farm was to sit down and think out a plan of operation. He kept the thinking up, too. It took him but a short time to see that if he followed his neighbors and produced hay, rye, second-class milk and poor crops of potatoes and truck, the mortgage would fatten on him; as it was, he wanted to fatten on the mortgage. Without knowing anything about chemistry he reasoned that water is the cheapest thing a farmer can sell—particularly from such a wet farm as his. In what form could he best sell water—in other words, what crops took most water and least fertility away from the soil? After studying the matter over, he decided that eggs and strawberries were his best water-crops. Keep the hens busy in winter while the strawberry-plants are asleep, and let the hens take a vacation while the strawberries work like giants. For extra and surplus crops, take potatoes, onions, celery and cabbage. They will not interfere with the strawberries. They are all particularly

well adapted to hen-manure, and the trimmings and waste are all useful for hen-food. This was his plan, and he stuck to it so well that in 1890—after 12 years of careful work—he sold the following lot of produce (an accurate cash record of every cent spent or received and every egg laid has been kept for a dozen years):

Eggs	\$776 65
Potatoes	314 15
Strawberries	2,601 22
Chickens	25 00
Onions	90 00
Pears and other fruits	99 96
Milk	107 24
Rye and straw	76 40
Cow	47 00
Total	<u>\$4,137 62</u>

There is not a single 100-acre farmer near him that sells anywhere near half of this amount. The hens "carry the farm on their backs," that is to say, their eggs give winter profit while their manure furnishes the basis for the fertilizer that keeps up the farm. We have no space here to describe the methods employed in potato and strawberry-culture. We merely discuss the live stock—the hens—which sustain the farm's prosperity. The day the writer visited the farm was cold and blustering—one of the coldest of the winter. A respectable hen might have been excused for going "on a strike" in such weather, yet on that day the 380 odd hens presented their owner with 225 eggs, which were worth then about three cents each.

The birds were housed with great care. They had not seen the outside of the house since Thanksgiving. We brought some snow in on our boots and the hens rushed for it greedily. That was the only chance they ever had of knowing what snow was like. From 60 to 75 hens are kept in each house. For 50 hens a house 12x24 feet is about right, provided it is kept thoroughly *clean*. That means that each hen should have about six square feet, if kept in the house all winter. Mr.

Johnson finds it cheaper to put the six feet under roof than to make the hens run outdoors for some of the space. The houses are made of one thickness of matched boarding with one thickness of tarred paper inside. Abundant window-space is left in the south side. Mr. Johnson likes a floor of concrete better than any other material. The floors are kept well covered with chopped marsh-hay in which the hens scratch and play constantly. This hay must be changed *every week* at least, and the whole floor swept off before new hay is put in. Directly under the window is placed a large, shallow box containing dry road-dust. In this the hens stretch and rub themselves every day with great satisfaction. The roosts are arranged at each end of the house, about as shown in figure A. They are about three

FIG. A.

feet from the floor at the lowest end. The sloping platform is about one foot below the roosts. The droppings fall on this platform and roll down into the gutter. The platform and gutter are sprinkled *every day* with road-dust, in

which a little carbolic acid has been mixed. Twice a week the platform is scraped off and the droppings are carried out and put in a house by themselves where they are thoroughly mixed with plaster. The inside of the house is frequently whitewashed with a wash containing a little carbolic acid. If the carbolic acid about the platform and roosts does not keep lice away, the roosts are washed with kerosene and the hens are caught and dusted with sulphur. The nests are neat and clean—each one provided with a china nest-egg. They are built under the manure-platform, the darkest place in the

house. The ventilation problem has troubled Mr. Johnson quite a little. There is a trap-door at the top of each house which can be opened from "a crack" to two feet. Formerly Mr. Johnson thought the hens needed plenty of fresh air, so he spent quite a little time in seeing that his ventilators were properly opened. Lately he has found that the hens have less roup and less trouble generally when the ventilators are shut tight. The trouble is to keep the air *out* rather than to let it in. Mr. Johnson now keeps his houses shut up tight in cold weather. There are no draughts, and cases of roup are almost unknown. The first element of success, therefore, is a large, warm, *clean* house, in which the hens must *stay* all winter.

Mr. Johnson considers the Leghorns about the best layers in the world. They are also, he says, the best to keep in confinement, because they are naturally active and least apt to become too fat to lay. They will produce an egg for less food than any other breed, and are also good for broilers or roasters. His birds are mostly a cross between the Whites and Browns. The Browns, he says, lay more eggs than the Whites, but their eggs are a trifle smaller. The cross seems to take the good points of both breeds. Hens are selected for their laying qualities. Mr. Johnson does not believe much in "type" so far as shape is concerned. A good laying hen *acts* like a layer—she is active, busy and "important." Generally she is of medium size, well-built and nervous, with a good head and comb, but her actions are the surest signs. A man who makes a business of poultry-keeping comes to know his hens so intimately that he can tell the good layers at a glance, though it is impossible for him to describe to another just what the "points" of the layer are. These cross-bred hens give birds of all colors, though the Browns largely predominate. There are birds here known to be cross-breeds, precisely like the "Buff," "Spangled," and "Dominique" Leghorns exhibited at the poultry-shows as "new breeds." At least a dozen or more of the breeding of 1890 were coal-black, yet there was nothing but Leghorn blood in them. Mr. Johnson

likes the black birds and determined to breed more of them. He, therefore, put his Black Leghorns in a pen by themselves and bred them to a fine Black Minorca rooster. He has now over 250 black pullets, somewhat larger than Leghorns and with black legs. He has great hopes that they will prove fine layers. He has no desire to grow thoroughbred birds for sale—all he wants is the hen that will lay the most eggs in winter, and he hopes these black hens will fill the bill.

The eggs are collected every night and an egg-record is carefully kept. In 1890, just 40,491 eggs were taken from the nests. The hens average from 135 to 140 eggs per year. The best average ever made on this egg-farm was 160 eggs for a flock of 270 hens. No incubators are ever used. These laying Leghorns are not at all anxious to sit, but enough are induced to do so every year to keep up the stock of pullets. The Leghorns are better incubators than mothers. As nurses they are failures, so the chicks are reared in brooders and their mothers are requested to lay again, which request they generally comply with after a little fussing.

The hens are set in a room by themselves very much after the plan described by Mr. Hales in this volume. Nests are made on pieces of sod and lined with chopped hay and tobacco-stems. The chicks are taken from the hen when about a day old and put into warm brooders until they are large enough to run outdoors, when they are placed in coops much like that described by Mr. Grundy. When the chicks are large enough to distinguish the cockerels from the pullets, the former are taken out and sold for broilers or put in a pen by themselves. The pullets run in a large field, well fed and cared for until about Thanksgiving, when they are housed and pushed as hard as possible for eggs. The winter's flock is generally about evenly divided between pullets and two and three-year-olds. Mr. Johnson considers three years the limit of a hen's profitable life. The pullets are useful because they begin laying earlier than the old hens. Their eggs are small at first, however, and would not give satisfaction if sold by themselves.

The hens are marked on the foot with a common toe-punch, one mark for each year. Two-year-old hens are used for breeding, about 15 being put with one lively cock. Mr. Johnson says he sells the three-year-old hens, dressed, to special customers, who declare the Leghorns to be the best roasters they can find. "Just like a bird," he says, "in breast-meat." After they quit laying they will fatten readily. He has sold hundreds of eggs to men who raise broilers exclusively. Most of them, however, are sold to one dealer who retails them. They are packed and shipped in neat baskets holding ten or twelve dozen each.

Great care is taken in feeding these hens. The entire grain-bill for the hens, one horse and two Jersey cows is about \$400 per year. At half-past six every morning the hens have breakfast served *warm*. This consists of boiled small potatoes, mashed and mixed with meal and bran with a little ground bone and pepper and a quantity of charcoal and chopped meat, all mixed together. Enough feeding-dishes are used so that the hens will not crowd and walk over the food. The charcoal is brought from near-by charcoal-pits, the grain is brought back from Paterson in the market-wagon, and the meat bought at a lard-rendering house. At noon the hens have green food—one day the trimmings of cabbages chopped as fine as possible, and the next, clover-hay chopped and steamed. An hour before sundown they have a feed of whole grain, wheat and corn, almost two-thirds wheat. This is scattered in the hay, where they have to scratch for it. Oyster-shells are kept before them all the time. Mr. Johnson says that many authorities claim that shells are not needed, but he notices that the hens like them, and he is trying to please the hens rather than the authorities.

The object is to give the hens a variety of feed that they like. The green food is of great value; it keeps the hens in good health and gives bulk to the ration. Mr. Johnson believes thoroughly in chopped clover-hay. Green cabbage is also excellent and boiled potatoes he regards as almost equal

to grain when mixed with chopped meat. He is able to buy lean-meat scraps for a very small price. If he was unable to get them, he says he would certainly buy a bone-cutter. There is very little sickness in this flock because great pains are taken to keep out all disease. Mr. Johnson believes in the "Douglas Mixture" to a certain extent, and uses it moderately whenever the fowls appear dumpy or out of sorts. Whenever a hen seems really ill she is taken out of the house at once and placed in a coop by herself. Mr. Johnson says that 500 hens are all that one man can handle successfully. They can be made to pay a profit of \$1.50 each as a winter job alone. Not the least valuable thing about this business is the way the manure is utilized. Hen-manure is often called unsatisfactory because it makes potatoes "run to vine." The trouble is that it is not well balanced—that is, it contains a greater proportion of nitrogen than a perfect manure should. Mr. Johnson found this out after many trials, and he went to work in the right way to remedy the matter. The hen-manure is first mixed with plaster. This keeps it dry and holds the nitrogen in it. In the spring, instead of using the clear hen-manure, Mr. Johnson uses a mixture of 400 pounds dried and sifted manure, 200 pounds dissolved bone-black, 100 pounds muriate of potash and 150 pounds of plaster. This, when fined and thoroughly mixed, makes a fertilizer which is equal, on his soil, to the best chemical fertilizers sold in the market. It is particularly good for potatoes and strawberries. In many respects this is the best use that can be made of hen-manure. The proportions of bone and potash will vary for different soils and each farmer must determine the right proportion by experiment. A combination of this sort will be very sure to give better results than when the manure is used alone.

Those who desire to apply the droppings alone will find little value in the tough hard clumps in which dried manure appears in the spring. Mr. P. H. Jacobs is an advocate of keeping such manure wet. We give his views here in order to contrast his method with that of Mr. Johnson :

KEEPING POULTRY-MANURE.

To mention briefly how to prepare the droppings in order to avoid loss of fertilizing qualities, it may be stated, that the well-known methods of mixing the droppings with earth or ashes, and keeping them dry, result in a great loss of ammonia, which is generated and carried off by evaporation of moisture, while the large amount of silica (eaten by the fowls as grit) in the droppings, by various chemical changes that occur, form silicates (mostly silicate of lime) which are not only insoluble, but, as is well known, render the droppings as hard as flint.

As water will always absorb ammonia, there is but little loss of that substance as long as the droppings are damp; but as decomposition occurs until changes are no longer taking place, unless the conditions are altered, the droppings, when very dry, will have lost their principal value, and perfectly dry earth, mixed with them, serves only to give bulk, unless the whole is compacted or protected from the influence of the air, which brings moisture to be absorbed by the dry dirt, the moisture carrying off any ammonia existing in the droppings whenever it is again evaporated as the air becomes dry.

The proper method of preserving droppings is to keep them *damp* (not wet), and they should be collected daily. Mix the droppings with twice their bulk of dry earth, sifted coal-ashes, or dry muck, and keep the mass moist with soap-suds. The soap-suds will form fat-acids, which in turn exert a chemical influence on the whole, forming compounds or salts of various kinds; but the greatest benefit occurs from the breaking up of some compounds and the forming of others, the reactions being numerous, rendering soluble that which is inert and almost valueless otherwise.

As practical experience is better than theory, those who will experiment with the use of soap-suds for preserving droppings, and who will keep them moist, not allowing them to become dry, will find that there is a great advantage in the damp method, the presence of ammonia being always perceptible, and the droppings will be ready for use at all times, being of a soft, pasty mass instead of dry, gritty and insoluble.

FEEDING THE HEN.

CHAPTER XII.

IN describing the methods used by Mr. Johnson and Mr. Wyckoff, we have given the views of two very successful *feeders*, which cover about the whole story. Details, however, must be worked out by each individual. Breed, location, markets, farm-crops, &c., must all be considered. The point is to secure as cheap a ration of good food as is possible. Meat, bones, garden or farm wastes may all be used to cheapen the cost of the ration, and some grains are cheaper than others. These matters must be studied by the individual farmer. Here we merely give a general idea of the practices of successful men. In a general way it may be said that wheat is the best grain for egg-production. Corn alone is not satisfactory unless fed with milk, meat or some non-fattening food. Rye is a poor food for poultry. Oatmeal is excellent, but whole oats are too sharp and pointed and sometimes cause trouble. Green food of some sort is absolutely necessary. Cabbage, kale, apples, clover-hay, etc., supply this. In winter, a warm, soft mash of grains, meat and potatoes is excellent, with wheat for dinner and corn for supper—whole grain spread on the floor in clean hay where the hens must scratch for it. Successful hen-feeding is a science that must be mastered in detail by the individual feeder.

What the Hen Wants.—Arthur D. Warner gives this advice: "I found it profitable to give warm water in cold weather. Boiling water put into the troughs melts any ice that may have formed during the night, and the water quickly cools enough for drinking. In summer a hen nips at a blade of grass, or a

clover-leaf; next a bug, a worm, or a bit of gravel enters her crop; then a seed or kernel or grain. She picks at an apple for a while, samples the raspberries, and if the garden-gate is open she will help herself to cabbages, tomatoes or young squashes. The hen is doubtless laying well all the time. Contrast this variety with the monotonous diet of corn some hens receive all winter. It is no wonder they do not lay. Hens have been known to lay fairly well upon a diet of mixed grain—corn and barley being chiefly given at the last feeding—and in the morning a warm mash of bran with a small quantity of corn and oatmeal added. The grain should be thrown among straw or similar litter, to make them scratch for it. If economy in feeding is desired, give three or four times a week, boiled turnips, beets, potatoes, carrots or any vegetable that may be in the cellar; all will be relished. It will help out wonderfully if cabbage is kept before them constantly. Raise an extra load for the hens. A cheap food is clear clover-hay cut fine, scalded and left over night. •Feed it with a little bran. Clover is rich in egg-food. Boiled beans are excellent. In the future I shall use my wheat crop for feeding. I have given up keeping pigs. I can get far larger results by feeding milk and refuse to hens. These will consume almost anything edible, even to portions of the straw thrown down for them to scratch in. An exclusive diet of the above tends to keep the hen healthy and warm, but induces fatness and can not produce an abundance of eggs. Meat, in some form, is always an essential part of the successful poultryman's scheme of winter feeding. If near a market, scraps of meat and bone can be obtained, chopped and fed raw, or meat and bone boiled up together. Our rule is never to give soft food to young chicks, unless it is a little bread moistened with milk. It would be better if dried and pounded, or ground in a hand-mill and fed dry. Meal is used only in the shape of corn-bread, and that is dried and ground. Cracked corn is given from the first, beginning with fine hominy, and increasing the size of the grains as the chicks grow, keeping the pieces as

large as they can conveniently swallow. I also begin with cracked wheat, but in less than ten days from hatching chicks will eat whole wheat, and will do well on that alone. Food of this kind does not spoil, and is kept before them at all times. Small quantities of boiled potatoes, or beans and ground meat are occasionally given. The land in the vicinity of my poultry-houses is being set to fruit-trees. Red raspberry and blackberry bushes will occupy the ground while the trees are growing. These furnish a shaded runway for the hens; they seldom touch the fruit. As garden or field-crops could not be raised on this ground, we can in this way get extra returns enough largely to pay the feed-bill. The bushes make a strong growth, being fertilized by the hens.

FEEDING SPECIAL FOODS AND WASTES.

There is no kind of food, animal or vegetable, that is not acceptable to the hen. She will pick up the hardest, flinty substances, seize all kinds of insects, regale herself on seeds of every description, and finds a variety in the leaves of the grasses and weeds. All kinds of refuse and waste material from every source, as well as the droppings of cattle, afford her luxuries that would possess but little attraction for larger stock. It is this propensity on her part to accept foods that could not be otherwise utilized that renders her a valuable adjunct to the farm, and permits her to convert into eggs many substances that would be of no value without her assistance. She is as perfect a scavenger of weeds as the sheep, is not even as fastidious as the hog, and is a greater producer, proportionately, than the cow, thriving in winter on dry food, or foraging in summer over luxuriant pastures.

Special foods in the summer season are unnecessary, as the hen is capable of selecting and securing a sufficiency of all that is required for supplying her needs; but there are periods when it becomes necessary to assist her, as the production of substances that are to be deposited separately from the body

demands certain elements that may be beyond the power of the hen to procure during those seasons when she is really a prisoner and deprived of her liberty. The natural period of laying is during the spring and summer, but domestication has resulted in inducing the hen to lay at a season of the year when the earth is sealed up with frost, and the storms and winds drive her to some place of security provided for her.

The hens that thrive on a diet of corn during the summer do not derive their nutriment from the corn alone, but from the variety of forage secured, and as the hen is more prolific during the warmer season she keeps in better condition for laying by the rapid conversion of the food into eggs instead of into fat, but overfeeding will eventually result in fatty degeneracy of the liver, and the hen is then more liable to disease, but in the winter she requires not only corn or other grain, but also foods that contain mineral matter and the essential elements that enable her to perform her work.

Among the foods sometimes allowed that may be considered out of the regular course are sunflower-seeds, linseed-meal (or oil-cake), rape-seed, millet-seed, charcoal and cut clover. These foods are beneficial more from a dietary standpoint than from the benefit imparted, yet they are also useful in assisting to provide the hens with a variety. Sunflower-seeds, linseed-meal, rape-seed and millet-seed, though highly nitrogenous, contain large proportions of oil, and are therefore fattening also; while the oils from them induce the shedding of the feathers, causing premature moulting. For that reason they should be fed as an occasional ration only (about twice a week), and they will then serve to promote digestion by regulating the bowels, linseed-meal having the same effect on poultry that it has on animals. The charcoal is indigestible, but when freshly burned serves to correct bowel disorders, as well as to assist in reducing the food in the gizzard.

The most important of all foods is finely chopped clover-hay, scalded, and fed in troughs. It is rich in mineral matter, nitrogenous, contains a large proportion of carbonaceous

matter, and by its bulk reduces or dilutes the concentrated grain-food. A healthy hen will eat from one to two ounces daily of this, which takes the place of green food in winter. It is very necessary that a plentiful supply of sharp, gritty material be always kept within reach of the hens, as they can not derive full benefit from any kind of food unless complete mastication results.

DIFFERENT FEEDING FOR DIFFERENT BREEDS.

The opinions given below came in response to these questions: Do the different breeds of poultry require different foods or methods of feeding to do their best? In other words, Would you feed a Light Brahma the same as you would a Leghorn? What particular difference in feeding should be observed? Is green food any more necessary for a heavy breed than for a light, active one? Is it possible to give any "standard" ration to a flock containing several different breeds?

Leghorns Do Better on Corn.—The Leghorns, being more active, will give better results on corn than will Light Brahmas. The best quality and kind of food depend largely on the condition of the hens, a laying hen requiring more nitrogenous diet. It is true that the food should depend also upon the breed, a less carbonaceous ration being required for a Brahma than for a Leghorn, owing to the fact that the Brahma is less active and more liable to fatten. Much depends on whether the hens are confined or at large, the green food being regulated by the season and the foraging of the hens. It should be given liberally to large breeds in preference to grain.—P. H. JACOBS.

Green Food Indispensable for Heavy Fowls.—Different breeds of poultry require different methods of feeding and different kinds of foods to secure the best results. A Light Brahma being of a less active temperament than a Leghorn, is more likely to become too fat to lay well if fed largely on a carbonaceous diet, than a Leghorn. The intense activity of

the latter requires more carbon to support it ; and what in a Brahma goes to fat, in a Leghorn is used up in movement. For this reason green food, while necessary for all breeds, is indispensable for those of a sluggish temperament, and for the same reason it would be impossible to give a standard ration for a flock composed of several different breeds, differing so widely in disposition as the Asiatic and the Mediterranean classes, though if a flock consisted of similar fowls of different breeds—for example, of Hamburgs, Polish and Leghorns, there would be no special difficulty in feeding all alike.—H. S. BABCOCK.

Disadvantages of "All Corn."—In my experience an exclusive corn diet has given small bones, diseased livers, dull plumage in young growing stock, even when they have had a large grass run. Those fed on mixed grain have made as good growth and been perfectly healthy. A Leghorn will stand more corn than a Brahma. The active laying breeds will stand heavier feeding without eating their eggs than the larger breeds. The amount of food must be regulated for a Brahma, while a Leghorn can be trusted to eat all she will, at least when laying. From habit I should think green food more necessary for the active breeds ; they certainly eat more when allowed to run at large ; but this may be no criterion to judge by. Throw down a lot of mixed grain, and they will eat, first, the corn ; second, the wheat ; then the oats, and last, the buckwheat ; yet I think the oats give the best results. The hens get tired of any one mixture, or single-grain ration, and need a change according to season, age or environments. I conclude that the nearest to a standard ration which one could get would be a mixed one. The larger portion should be bran, oats and wheat, there being only corn enough to keep the fowls warm. Green food, shell material and pure water should be liberally supplied.—C. E. CHAPMAN.

Hard to Fatten a Leghorn.—The kind of food that will cause one breed to lay an abundance of eggs will produce the same result in another. But, if Leghorns have an abundance

of food before them at all times, they will seldom become overfat, on account of their sprightly and roving disposition, and will convert a large amount of food into quantities of eggs; but with the large breeds this method of feeding would produce over-fatness. The consequent sluggishness of body and egg-organs would coöperate with their natural broodiness to reduce the egg-yield. The quantity fed to the large breeds should be regulated so as to keep the birds down to a business weight. Some strains of the heavier fowls make large egg-records, and it is reasonable to suppose that careful selection, breeding and feeding for eggs will make good layers of almost any variety. In case of large breeds, an increase of green food might dilute the concentrated ration, and tend to keep the birds in a business condition.—ARTHUR D. WARNER.

Cut Bones for Feeding.—Poultry-keepers have known for more than a century that the substances found in bones were good for poultry to eat. The great trouble was that these substances were locked up in such forms that the hens could not touch them. Various schemes were tried to unlock this food. The bones were baked in the oven or roasted in the fire and the resulting bone-ash was mixed with the grain. With a sledge and a big stone the boys frequently smashed up the smaller bones. But it soon became apparent that in burning the best part of the bones was driven away, while there were too many broken fingers as a result of the other process. The bone-mill finally came and brought relief, but that handles only dry bones. It soon became apparent that fresh or green bones, with meat and gristle, must lose much of their nutriment before they were dry enough to grind. The result was that a *bone-cutter* was perfected to reduce bone, meat and gristle to a form suitable for hens to utilize. This machine promises to revolutionize poultry-feeding. It will provide a cheap and excellent food—making doubly valuable what was formerly considered a waste product. In almost every neighborhood one can find a cheap supply of green bones. As to the merits of cut bone as a poultry-food all are

agreed that it is excellent. M. S. Perkins, writing from Massachusetts, says: "After the bone is broken small enough to admit of its reception by the hopper of the cutter, no difficulty will be encountered in the reduction of the hardest shin-bone to pieces sufficiently small to be greedily devoured by all kinds of poultry. The ducks and geese as well as the hens are very fond of it. Of course, turning the wheel is very laborious work, especially if it is long continued, or the bone is very hard, but then we must expect to toil if we would accomplish anything. It does the work required in an efficient manner, and is all that could be desired for ordinary establishments keeping from 100 to 200 fowls, or less. Cut bone I consider a very excellent poultry-food. It contains much fatty animal matter as well as mineral constituents, such as the phosphates and carbonates of lime, which latter must materially assist in building up a healthy framework in the case of young growing chicks, as well as in supplying egg-shell material for fowls of maturer age. Grain for the last year has been phenomenally high, and judging by the present outlook, prices are not likely to drop much during the ensuing season; therefore, I advocate feeding two or three times a week all the fowls desire to eat of this food, considering it cheaper at half a cent per pound than grain, and a much better stimulant to egg-production. Renderers in this locality charge 40 cents per 100 pounds for bones. There is no trouble getting a sufficient supply for this purpose. Every butcher's cart, provision store or slaughtering-house has an abundance for sale. The cut bone may be mixed with soft food or be given separately by itself. It is really immaterial in what way it is fed, provided it be given in a liberal supply."

The Color of the Yelk.—The color of the yelk of an egg is influenced more by the food and condition of the fowl than by anything else. At least that is my experience. It has been a favorite claim with some breeders of Brahmas and other Asiatic fowls, that the eggs from their pets have richer yelks, but I have bought eggs of the same breeds that contained very

pale-colored yolks, while the color of the yolks of Leghorn eggs was a rich yellow. During the winter months I found the greatest difficulty in obtaining rich-colored yolks, but always found the best among the eggs bought from farmers who fed their hens liberally with corn, and allowed them to scratch in the barns and yards. Grass, and especially clover, plays an important part in this matter. This was demonstrated to me forcibly not long ago. I had a pen of Indian Games at my father's place, but the yard in which they ranged was devoid of grass. The yolks of the eggs were pale. I removed the pen to my own place, where the fowls have a fine grass-run, and since then the yolks have been very fine in color. The palest yolks I ever found in eggs were gathered from a flock of hens that were fed principally on rye.—J. H. DREVENSTEDT.

How Can Little Chicks Eat Whole Grain?—The fact is, chicks of a few days of age eat but little, really, and they drink more, in proportion, than they eat. The gizzard is capable of pulverizing food without the aid of grit, but only to a limited extent. When grains are passed into the gizzard, and there is no grit there, the gizzard is assisted by the rubbing of the grains against each other, the water assisting to soften the food also. The gizzard of a chick is larger in proportion than that of the adult, and really performs less service; while the chick may be sustained in its early stage by the power of the gizzard to reduce the food, at a later stage grit will be necessary because of the greater work to be performed by the gizzard. Hence, while the chick may have no difficulty, on account of greater capacity, to reduce its proportionate amount of food, the gizzard of a larger chicken would soon be overtaxed, unless aided by grit, and the bird would die of inanition.

THE NATURAL METHOD.

CHAPTER XIII.

THE FARMER'S FLOCK OF HENS.

C. S. VALENTINE.

THE most purely natural method is a "go-as-you please" which allows the mother hen to feed, breed, nest and brood at her own sweet will. Must this be insisted on in order that the method may be called natural? Shall breeding stock be confined to such an extent as merely to bring breeding conditions under the control of the owner of the birds, or may we look upon any method that does not make use of the wooden hatcher and mother as natural? The last, I think, is now the commonest acceptance of the term, and with such meaning it will be used in this article.

First, then, even with natural methods it is far better that the breeding stock be selected, using the best cockerel with older hens, if a preponderance of pullets is desired. Let the hens be the pick of the whole flock in size, vigor and laying qualities. If it be impossible to make such selection, let the male be of the best, not related to the hens, and note the eggs of the best hens, using these for setting. A light feed of grain once a day, together with a little meat twice a week, will pay, even where the fowls have the freest range.

To hatch the chicks under hens is the natural way; it is also natural for the hens to be lousy, to fight among themselves, to break eggs and to leave the nests at random—at least these are some of the natural results of domestication. If even a fair number of chicks is expected, the sitters ought to be as completely subject to their owner's will and as free from other

interference as possible. Those of quiet nature can be removed to the hatching-room at night, with the precaution of giving them china eggs for a few days until they show that they are fully settled in the new quarters. If the general flock is allowed to molest sitters it is at the cost of at least half the possible number of chicks. Ordinarily it is better that the hen should sit in a fence-corner, sheltered by a few boards only, but in solitude, than that she be in the house with the laying hens. The sitters should have a regular run and feed, and attention enough to make sure that each returns quietly to her own nest, when all are comparatively safe for the next 24 hours—except from lice. The breed makes some difference with the number of chicks, as hens of pugnacious, uneasy breeds, or those of extra weight, cannot make as good sitters or mothers as those of medium weight and tranquil temper. Victory over lice may be secured at this stage of the work by a free and frequent use of good insect-powder or carbolic acid. Lice need not be very troublesome at any time if clean nests and good dusting facilities are always provided for the sitters. An earth nest will not invite lice as a chaff or hay nest will, and is so far preferable. It may be made in a box as well as on the ground. All nests must be hollowed at the center only enough to keep the eggs together. If so deep that some can lie above the rest, some breakage is certain, and one or two broken eggs, soiling others, may spoil the whole hatch unless all are cleaned at once in warm water. The box must be very little larger than the hollowed nest, and the corners should be filled as high as the rim of the nest, lest some eggs be pushed out by the hen in her efforts to turn them, or herself.

All eggs may be easily tested by any novice on the eighth day. Dark ones—the ones containing the chicks—can be doubled up and new settings given to part of the hens, the clear eggs being saved in a cool place until hatching-time. The yolks may form one-half the feed once a day for three or four days with perfect safety; the hens will be glad of the whites, and just that quantity of other food will be saved.

The chicks once fairly hatched, the heaviest work will consist in fighting lice, gapes, etc. Nowhere is the ounce of prevention better worth the pound of cure than in the chicken-yard. Gapes can be prevented by using chopped onion or garlic daily in the soft food, or can be largely warded off by keeping the chicks in a building on a board floor sanded or strewn with chaff, for two or three weeks, or until they get a good start. Lice can now be headed off by a liberal use of insect-powder and kerosene. Kerosene is safe if judiciously used any time after hatching (never before), and nothing else is so sure. But it will take off both down and skin if used too freely on young chicks. It is safe to brush the coop with it, to pass it lightly through the hen's feathers, and merely to touch the down on the chicks' heads.

If the hen and her brood are to run at large, they should be fed regularly, counted as regularly, and watched closely. Even this will not prevent loss in wet grass, through hawks, or through the quarrelsome propensities of mothers at odds with one another. To be master of the situation, one must coop the broods in floored, vermin-proof, non-choking coops; that is, in enclosures wide-slatted by day, and close-netted or close-boarded at night, with ventilation at the top if boarded.

Almost any feed is good if given in judicious variety; too much hard-boiled egg, scalded curd or raw corn-meal, or heavy allowances of thick, sour milk may cause bowel trouble, as may unwholesome water or lack of shade. Meat is not the safest thing to feed in unlimited quantities; many broiler-men taboo it for the first two weeks. Possibly it may be thought to have no place in the natural method, except as nature supplies it in the form of bugs and worms. Still, for myself, with that modified natural method under which I aim to have control of conditions, I should use meat once or twice a week if I could get it; but I would rather have bone than meat, if it must be a choice. Bone-meal I always use, and meat when it is at hand. Clean, pressed scraps, such as farmers can get at two cents a pound or less, are wholesome and pay well.

If chicks grow listless, neglect their food and show loose bowels, or the reverse, *look for the cause*. There is always a cause, and it must be found and removed. "What ails my chicks?" wrote a troubled owner to his favorite paper this very season. "They sit around listlessly, their wings droop, and after moping a few days, they die, one after another." This man was on the right track, because he was asking the cause. But the reply was: "Thousands of chicks die thus every year; we never heard of a remedy for this trouble." To throw an inquirer off the right track thus is culpable. There certainly was a cause for the death of those chicks. It might be that their ancestors had been inbred so long that they had no constitution; it might be that they had been subjected to a chill, or that they were infested with lice. If told this, the owner would have known at once whether or not the first supposition was correct; the second usually shows in bowel trouble and a pasting up of the vent; the third could have been overcome by the use of the proper means. Possibly he might not have been able to save the chicks on hand, but his question showed good sense enough to make it seem certain that he would see that next year's chicks did not "droop" thus, if he were given a strong hint as to the probable causes of the difficulty.

The prominent causes of disease, or of a condition which may invite disease, may be briefly summed up as follows: Generally a lack of ancestral stamina or vigor; specifically, raw or sour feed, impure water, lack of green food, lack of sharp grinding material, excessive sun heat, or the reverse, a chill or a drenching, filthy quarters, presence of vermin. Any one of these may take off half the flock while the owner is waking up to wonder what ails the chicks. Therefore vigilant watch must be kept for symptoms of disease, and more especially for the precursor of these wrong conditions, and such conditions must be corrected at once, if they exist.

A physician called to attend a typhoid fever patient never rests until he ferrets out the cause of the disease. He doesn't

give his medicines in poisoned water, which will constantly nullify their effect ; on the contrary, he orders an immediate and thorough change in every unfavorable condition. Those who keep poultry may well take a lesson from him ; for hens are very like persons as regards water, shade, diet and medicine, even to the size of the dose of the last. They feel the heat worse than do their owners, for they wear "winter clothes" almost throughout the year. They are even more thirsty than thirsty mankind, and are thus sure to be made unhappy through the lack of water, or sick if that to which they have access contains the germs of disease.

Another fact in connection with hens and chicks which, if noted, will give a key to every difficulty, is that the moment there is anything wrong with the fowls, the bowels are almost sure to be affected. Indeed, the droppings may be called a sure thermometer by which to gauge the condition of the flock. A sunken look about the eyes, and a pale face and comb will quickly catch the eye of the close observer, and these outward signs, together with listless instead of bright, quick and eager motions, may show even the novice that something is wrong. The hen in perfect health always takes an interest in life. If cooked food is not regularly used, a change to it is always wise at the first sign of bowel trouble. The one great point is to see that the digestion is kept perfect. This assured, and gapes and lice kept at bay, the chick has little to fear but accidents, which the foresight of the owner must and can largely ward off.

No raiser of chicks, whether for home use or for market, should be satisfied with raising less than 90 per cent. of all hatched. One out of every ten is all that he ought to afford to lose ; it is surely more than he can afford, if by any means he might have saved that one.

THE EGG-TYPE HEN.

CHAPTER XIV.

THE SUCCESS of several breeders in increasing the egg-laying capacity of their flocks by careful selection and breeding has led poultrymen to study the shape or type of their hens in the belief that there may be such a thing as an "egg-type"—that is, a peculiar shape and style characteristic of all good layers. The following questions were sent to leading American breeders. Their answers cover about all that is known on this subject.

"In your breed what shaped hen gives the best egg-record? Is it a hen with short legs, chunky body, a short neck and small head, or the reverse? Can we improve the laying qualities of a flock by continued selection of this type? Would you pick out the bird scoring the highest by the standard for the best layer?"

A Laying Wyandotte. In connection with my Silver Wyandottes, my ideal hen for a good layer is one with a broad, deep, round body of moderate length and not too chunky. There is no doubt at all in my mind as to the possibility of breeding to develop this shape, any more than I think there is a doubt of our ability to breed with certainty a particular type of cow for either butter or milk production, by the continued selection of a certain type. I would not always pick out the bird scoring the highest by the standard for the best layer; still the American Standard of Excellence for Wyandottes describes a good layer, especially if the Silvers are considered; for birds of this variety are, in my opinion, the best layers in the Wyandotte family.—J. D. TOMKINS.

Live Leghorns. Hens the reverse of the above description are usually the best layers, at least such has been the case within our experience and observation. We are of the opinion that much good might be accomplished by properly selecting and breeding the best laying specimens in the flock. This has been our aim for a number of years, with very satisfactory results. We do not consider the highest scoring specimens in a flock, as a rule, the best layers—the coarser specimens are not the best scoring birds, but are usually the best layers.—KNAPP BROS.

A squarely built, blocky, well-proportioned hen, wide on the back and with legs well apart, will produce most eggs. The legs and neck should be of medium length, and the finer the texture of the face the more eggs will be produced. Laying qualities can surely be increased by selecting breeders. The highest scoring hen counts but little for eggs.—C. A. SHARP.

Long Langshans. I have noticed that among Langshans, the hen that gives the best egg-record, is the one that has a long body and stands well upon her legs. One can certainly improve the laying qualities of a flock by continued selection of those hens that make the best egg-record, for breeders. In all cases I would not pick out the bird scoring the highest for the best layer.—E. P. KIRBY.

Non-Sitting Brahmas. Among Light Brahmas I think a rather long-bodied hen will lay best. I don't think the shape of the head has any thing to do with it. One thing is sure—if you set the eggs from a good layer her progeny will be good layers. Set the eggs from a Brahma hen that never wants to sit, and her pullets will be non-sitters. No; I would not select the highest scoring hen for the best layer. I don't think scoring has anything to do with egg-production.—P. WILLIAMS.

Wyandottes and Plymouth Rocks. I have never noticed that the best laying hens had any peculiar form, and I have my doubts if the general form and make-up have anything to do with the laying qualities. Some hens are more prolific than others, and if these are selected as breeders the laying qualities

of the flock will be improved. A high-scoring fowl will lay no better than one of ordinary merit, but I have found that my finest specimens were good layers, and their attractive appearance, both in form and plumage, makes it a pleasure to care for a flock of high-scoring standard fowls. My varieties are the Plymouth Rocks and Wyandottes, and I breed them with deep, full breasts and broad bodies and orange-yellow legs, all desirable market qualities as well as high standard points. I have had flocks of these breeds that averaged 200 eggs each in a year, and if there is any form that will make them do better I should like to know it; but I do not believe there is.—A. C. HAWKINS.

Actions Speak Louder Than Shape. From the peculiar shape or type of an individual specimen of a breed of fowls, I don't think anybody can tell whether she is or is not a great egg-producer in comparison with the other members of the flock. But from her actions as a pullet, when nearly matured, one can almost always say, with a fair degree of certainty, that the bright, active, nervous, mischievous specimens, in short, the workers, those that are always busy, are the shellers-out of the eggs. The laying quality of any breed can be improved by continually selecting and breeding from those specimens that are the greatest layers, regardless of type or markings, if eggs are all the breeder is desirous of obtaining.—F. B. ZIMMER.

A Good Layer is Active. I find that a hen of rather light build, indicative of great activity, and of medium, or perhaps rather under medium size for the breed, is usually the best layer. "A hen with short legs, chunky body and small head" is not the best type for a prolific layer, though, in exceptional cases, such hens may prove good layers. To improve the laying qualities of a flock of fowls it is better to select the best layers, let their type be what it may, and mate them with male birds bred from good layers, than to attempt to do this simply by selecting a given type, although it may be possible to make improvement in laying by selecting the type that is indicative of great prolificacy.—H. S. BABCOCK.

An Egg-Record Needed. I think the only safe way is to keep an egg-record, a thing that I have done for the past six or seven years. I know it is comparatively easy to select the milking-type in cows, but I never trusted to that alone, but kept an individual record with each cow. That told a story in black and white, often at variance with all the most approved theoretical selections. The reason why shape cannot well determine the egg-laying trait is because the birds are covered with feathers which may completely hide the "egg-type." As a rule, I would always prefer a fine-boned hen to a coarse-boned one. The leading layers of the world are the Hamburgs, and their trim bodies, fine bones, quick and nervous actions, convey the impression that they are susceptible of being forced for eggs. The Leghorns are in the same class. Yet when we get among the heavier breeds and study the Brahmas, Cochins, Plymouth Rocks and Wyandottes, we are apt to be greatly mistaken in selecting layers. The best Wyandotte hen I ever owned, as regards laying, weighed eight pounds, was full and deep in the breast, long in the body and back, and fairly long in the neck, with a small, neat head. She laid 28 eggs in 36 days. The best old hen I now own is four years old and lays regularly, but no man would pick her out for an "egg-type." She is loosely feathered, has an enlarged crop, is low down with short legs; yet she was always a good layer. The Indian Game hen is exceedingly well built for an "egg-type," having the stern superbly developed, yet I have never heard of Indian Games being superior layers, although some claim they are exceedingly good in this respect. The egg-laying trait in a hen can be developed in most breeds by proper care in feeding and handling.—J. H. DREVENSTEDT.

Attention is called, in this connection, to the article by Mr. Wyckoff elsewhere in this book. He has been very successful in this matter of breeding layers. We fully agree with him that selection and breeding is of the utmost importance. We need a new "standard" or "scale of points" describing the *best laying hen*, not the *best looking hen*.

THOROUGHbred POULTRY FOR FARMERS.

CHAPTER XV.

J. H. DREVENSTEDT.

The value of thoroughbred poultry to the farmer is fully as great as that of thoroughbred stock of any other kind. It costs no more to keep, brings better prices and is altogether more profitable than common barn-yard stock. When I first engaged in farming, little heed was paid to the hens. The farm, the garden, the cattle and horses were carefully looked after with an eye to profit, but the hens were a side issue. The flock was mixed, and was of no particular breed, and the eggs and dressed poultry were like the flock—mixed also. There was no uniformity in the product, consequently it sold in the markets as ordinary produce. That means ordinary prices and little profits.

Like all young poultrymen, I bought eggs and fowls of many different breeds, and while I never regret the experience gained in breeding half a dozen different varieties at one time, I soon discovered that a farmer has no time for such expensive fancy poultry-farming. I then selected the breed that I liked best and determined to go in for profit. The five years during which I kept stock on the farm convinced me thoroughly that poultry-culture was a very profitable thing. A ledger account showed that the hens paid far better than the dairy cows, both products being sold at good prices.

It is commonly supposed that thoroughbred birds are of no account for practical purposes, being bred simply for fancy points. This is true only so far as the management of the birds is concerned. A fancier does not care for egg-records, but believes in feathers only. He pays the price, and it is a large one, to obtain a desired "point." He pens up his birds, he breeds them in and in, he "conditions" them for the show-

pen and the natural results are fine plumage and often delicate and unprofitable birds. Such a course has killed a number of fine breeds for profitable purposes.

The selection of one breed means a uniform flock of birds. Such a flock attracts the attention of neighbors and visitors, especially if well kept. The eggs being from one breed, are, as a rule, uniform in color, which enhances their market value; the broilers and dressed carcasses are uniform in color and, if well fattened, bring the top prices. The thoroughbred trademark is there. Eggs can be sold for hatching-purposes to neighbors at an advanced price, and the demand for thoroughbred cockerels in the fall is another source of revenue.

The farmer will naturally be puzzled to select the best breed for his purpose, for in these days every breed has its strong champions, and there are scarcely any poor ones, if we can believe all we read. A farmer must always bear in mind what his market desires, and whether he can profitably sell eggs only, or both eggs and meat : on this depends the selection of breeds. In New Jersey many farmers and practical poultrymen select fowls that lay white eggs, because the latter bring higher prices in New York city and Newark markets. The Leghorn is the favorite, and it is doubtful if there is anything in the whole poultry kingdom that can exceed the Leghorns in their large and valuable egg-product. It is true that there are other breeds that lay white eggs, such as the Minorcas, Andalusians, Polish, Houdans, LaFlèche and others, but, excepting the first two, they will not lay nearly so well as the Leghorns. The Minorcas and Andalusians lay very fine white eggs and plenty of them, but the edible quality of their meat is not prized in our American markets because of the black shanks and white skin that belong to these breeds.

The great success of one noted firm of poultrymen is due largely to the fact that they keep only one breed, and that the White Leghorns. While they do a large business in selling fowls and eggs for fancy purposes, yet the flock they keep turns out a large revenue in the sale of fresh eggs. Another

point in favor of the Leghorns is that the surplus cockerels when killed as broilers and spring chickens make handsome carcasses that sell well in our markets. White eggs that are absolutely fresh will average over 35 cents per dozen during the year. They retail in New York city at from 40 to 75 cents per dozen, according to the season and the location of the market. There is little difference in the laying capacities of the different varieties of Leghorns, but for practical farm use I would prefer the Whites. Another advantage is the wonderful fertility of Leghorn eggs. They always hatch well, and are especially adapted for hatching in incubators.

Where eggs and meat are desired, I pin my faith on the Wyandottes and Plymouth Rocks. Both breeds are fine winter layers, and if the eggs are carefully selected for hatching purposes, a strain of fowls will result that produce a fine lot of uniformly brown eggs. I could always obtain as much for brown eggs as for white, but my markets were the special customers in the city who simply desired clean, fresh eggs. The best way to handle these breeds is to sell the eggs from September to March, when eggs are high in price. Begin in the month of January to set eggs for early pullets. The latter will commence laying in September in time to supply an active market. I generally continue to set eggs up to May 1, when I sell off the surplus old hens, keeping only the finest ones for breeding purposes the next winter. By using eggs from two-year-old hens for hatching, better stock will result, as a rule. The first lot of chicks will contain many cockerels that can be profitably sold as broilers, but in all later hatched chickens, the cockerels had best be allowed to reach four to six pounds before they are sold, as the demand for such roasters is always good, especially after August, but not later than November. From November to January 1, the general market is apt to be flooded with poultry.

In regard to handling thoroughbred fowls for laying, I always pen them up, usually 20 to 25 in a pen, in a yard of 50x20 feet. More eggs can be obtained in this manner than if

the fowls are allowed their liberty. The pens for breeding usually contain 10 to 12 hens, mated to one cockerel, and if possible they are allowed free range. The laying hens need no male. The hens in the laying-pens that are to be kept over for another season are turned out to pasture after May or June, and fed oats or buckwheat once per day. The forcing for eggs throughout the summer from hens that laid during the winter will retard the moulting, and too much "dead timber" in the fall and winter will be the result. Hens allowed to pasture and not forced with grain will moult out nicely. I remember that all my Wyandottes moulted by November one season.

In raising thoroughbred chickens, whether by natural or artificial means, the great point is to follow closely nature's methods. A hen with her brood on a nice shady grass-run will bring up strong chickens. Brooders or artificial mothers, except in the early spring months, must be outdoors, where the chickens can have a good range. During January, February and March, chicks do well enough when raised indoors, but as soon as the temperature gets over 60 degrees, the sooner they get outdoors the better. This especially applies to Leghorns and other quick-feathering breeds. Deprive the latter of a good range, and poor and sickly chickens will be the result.

There are numerous other excellent breeds, notably the Light Brahmas. The latter in the hands of such skillful breeders as James Rankin and I. K. Felch, bring large returns. The Langshan is a fine fowl, a good layer and has fine meat; but the black legs and the white skin do not take in the general market. In a fancy market, however, the Langshan has many admirers. One dealer in Fulton Market, New York, has informed me that he obtained extra prices for their carcasses. The Indian Game has unquestionably the finest breast-development of any fowls I am acquainted with, and looks meaty and appetizing in every way; but it has not been sufficiently tried in America to enable one to estimate its practical value. Properly selected and bred, it should reach the top notch.

THE PROFITABLE DUCK.

CHAPTER XVI.

JAMES RANKIN.

THERE is a great difference in the care and food required for growing ducks and chicks, although intelligent attention and the observance of a few simple rules will insure success with both. In raising ducks it is not, as most people suppose, necessary that the birds should have water to disport in. Indeed, access to a pond or brook will seriously retard both their growth and fattening. The very best possible place for rearing and fattening ducks is a dry, shady yard where they should have a plentiful supply of water to drink, but for no other purpose. After they are 48 hours old, the little ones are hardier than chicks, but require just as much care, though of a different kind.

I am in constant receipt of letters from all parts of the country, complaining of the great mortality among ducklings, yet, by observing a few simple rules the trouble could have been easily avoided. It is needless to say that the eggs should be carefully attended to during incubation to insure a good hatch of strong, healthy ducklings; for a small hatch of feeble, weakly birds never can be matured and fattened in good shape, for there will be a great mortality among the little ducklings in spite of the most generous care. The conditions must be right from the start. We usually remove to the brooder the strongest and those first hatched, leaving the younger ones in the machine twelve hours longer. Care should be taken not to overheat the brooder, as the animal heat in the little birds will always increase the temperature in the brooders a few de-

grees, and the result of overheat is dysentery. The food has little, if anything, to do with the matter—(remember this). By far more ducklings, and chicks, too, are killed by overheating them in brooders than by all other causes combined, and, strange to say, the mortality is always attributed to the food. A temperature of from 75° to 80° is quite sufficient, started at 80° and reduced to 75° after a few days.

Food should always be prepared in anticipation of the removal of the birds from the machine, and should be placed on a clean board on which strips of lath should be nailed half an inch high to prevent the ducklings from scraping the food off, or any dirt on, the board. The food may consist of cracker-crumbs or stale bread, mixed with infertile eggs boiled hard and chopped fine—about one part of egg to four of bread. All they will eat and no more of this should be fed at least once in two hours. Water should be given at the same time. We use little fountains for the purpose, so that the ducklings can get all they want to drink without smearing their bodies. Care must be taken about this, as ducklings for the first 48 hours are more susceptible than chicks, to both wet and cold. They should be fed in this manner for the first three or four days, when equal parts of meal and bran scalded, with a little animal meal mixed in, can be substituted, the proportion of meal being gradually increased and that of bran decreased as the birds grow older. The scalding may be omitted when they are ten days old. It is well to scatter a little sharp, dry sand on the bottom of their feeding-troughs about once a day to assist their digestion. Finely ground shells should be kept by them at all times, also a liberal supply of green food, in the shape of refuse cabbages chopped fine, green rye or green clover, according to the season.

When ducklings have reached the age of two or three weeks, there is great complaint from amateurs of weakness in the legs. This is attributable to one of two things, viz.: too much heat in the brooders, or too highly concentrated food. While chicks and ducks are young, and quick growth is desira-

ble, nitrogenous food should be used in order to promote the growth of bone and tissue. At a later period, when fattening the birds for market (which will require from ten days to a fortnight), and fat is the main object, carbonaceous food should be given. Great care should be taken to feed no more than they will eat clean. Indeed, it is always best to keep them a little short; they will then fatten more readily, as no creature when overfed and clogged will take on fat. My method is to allow the birds ten minutes to eat, then clean out the troughs and turn them over so that the birds will not fill them with excrement. They will then be clean and ready for the next feeding.

When six or seven weeks old, ducklings, when closely confined, often acquire the habit of eating the feathers from each others' backs. This should be attended to at once and the offenders should be confined by themselves; for if the practice is allowed to become general, as it surely will if all are kept together, it may cause great trouble. In this case the birds should be transferred to a grassy yard and the quantity of animal food be increased. When the birds are ready for fattening—which will be when they are about nine weeks old—the quantity of meal should be increased to 90 per cent., and the birds should have plenty of water and shade. At this stage and even before, when they are confined in large numbers, they are very apt to get frightened in the night. In such cases they crowd together in a compact body and whirl around with the greatest rapidity and keep it up throughout the night, making an unearthly din, the weaker ones often being trodden down. Of course, this puts an end to all fattening, unless it is speedily stopped. This can be easily done by hanging a lantern near by, about two feet high, when the birds will congregate around it and quietly settle down.

When the young birds are ready for market, if one has a large number, it is better to secure the services of an expert to dress them tastily. In a fair day's work he can dress 40 ducks, though I have had men who could pick sixty, and do it

well. The process is very simple : All that is necessary is a chair, a box, 2x3 feet and two feet high for the feathers, a few knives, and a smart man to handle them. One knife should be double-edged and sharp-pointed for bleeding. The bird should be held between the knees, the bill held open with the left hand, and a cut made across the roof of the mouth just below the eyes. The bird should then be stunned by striking its head against a post or some hard substance. The picker seats himself in the chair, with the bird in his lap, its head being held firmly between one knee and the box. The sooner he gets at the work the better, and if he is smart, the bird will be well plucked by the time life is extinct. The feathers should be carefully sorted in picking ; the wing, tail and pin-feathers should be cast away, and the body-feathers, with the down, thrown into the box. Care should be taken in the matter, as the feathers are no mean source of income and will always pay for the picking. They should be spread out and dried. When dressed, the birds should be thrown into ice-water until the animal heat has been extracted—when they can be packed closely in clean boxes and shipped to market at any time within twelve hours, without ice.

A FEW BUSINESS MATTERS.

CHAPTER XVII.

Making a Prime Egg-Market.—It is hard to coax 300 hens into profitable egg-production, but it is harder yet to develop a prime egg-market. Anybody can ship eggs to the city and take what the commission man see fit to return, but this business is not satisfactory to the man who knows he has a first-class article, and is doing business enough to warrant him in guaranteeing fresh eggs. How can he establish his reputation for honesty and care in the minds of those who buy his eggs? How do you make a trade-mark valuable? In the first place, a man must make up his mind that he must spend time, money and patience. The point is to get in with some responsible dealer and convince him that the eggs are strictly first-class and that they can be supplied in certain quantities. Have a circular neatly printed, stating, in large type, that you will guarantee every egg sent out to be fresh and good. Offer to supply one dozen fresh eggs for every one found bad or stale before a certain date. Stamp every egg with a neat stamp showing just when it was laid. Never let a soiled or badly colored egg go out of your house. Have a card neatly printed with your name, address, egg-guarantee and a popular name for your poultry-farm. Scatter your cards and circulars wherever you go. Write letters, inclosing your cards and circulars to every hotel-keeper, every first-class grocer and provision-dealer you can hear of. Put a neat advertisement in the paper that circulates among the best people in your town or village. Make a visit to large places near by, show your eggs and tell what you are doing. In short, believe in yourself and in your eggs, and then—"blow your horn"! If

you blow hard enough you will be sure to pierce somebody's ear and hold his attention. In order to build up a "special" market, a man must cultivate self-reliance—not "cheek," but an honorable opinion of himself, his work and his product. The world loves a self-reliant man and will take pleasure in following him—in the egg-business as well as any other.

Limed Eggs.—Do not sell eggs when the price is low. Pack them in lime pickle, and take all the cash you can spare and buy good fresh eggs of the neighbors to be also packed. New-laid eggs put down in this way can scarcely be told from fresh ones when taken up. Hotels and boarding-houses are glad to get such eggs at an advance of one or two cents over ruling prices for limed eggs. For liming small quantities of eggs, casks with wooden hoops are best. The following is the proportion for pickle: Stone-lime, two pounds; salt one pint; water four gallons. Slake the lime, and when cold put it and the salt with the water into some receptacle, stir and let settle twice; the clear liquid is what you want. Have just enough pickle, when through packing, to cover the eggs, then place a cloth over them and spread some of the lime sediment on it.

Caponizing.—Full directions for performing this operation will be found in the pamphlets of those who have tools for sale. The great majority of poultrymen do not try to raise capons. Some breeders of the smaller breeds caponize their surplus roosters, but most of them prefer to raise roasters or broilers. James Rankin thus states why caponizing does not pay him: "I had some experience with caponizing 20 years ago, and found the business very profitable, as the birds readily brought from 30 to 35 cents per pound. At present, when capons bring but little more than half that price, it is not nearly so profitable, and for this reason I have given it up. I can get out a Brahma chick the latter part of January or the first of February, put him upon the market by the first of June, when a little over four months old, when he will dress six pounds, and get \$3 for him as a roaster; while a capon which I had caponized and kept for nearly a year, though he weighed eight or

nine pounds, would bring no more money and would have cost us nearly double in both care and food ; so I find decidedly more money in growing roasters than I can possibly find in caponizing." The profit in caponizing seems to come from buying young roasters in the city market at live-weight figures and turning them into capons to feed through the winter. Few think it pays to raise capons from the egg.

Eggs From Cross-Bred Poultry.—Many people are fond of crossing poultry—preferring a cross-bred hen to a full-bred fowl. It is claimed that such hens are better layers than either of the breeds that make up the cross. This is an absurd claim, though such crossing does frequently result in a more satisfactory egg, in that it is larger than that of one breed while there are more of them than the other breed naturally produces. But these crosses sometimes give unsaleable eggs. At the last New York poultry-show eggs of the different breeds and their crosses were shown. The darkest eggs were from Buff Cochins ; those of Light Brahmas are a trifle lighter, with Dark Brahma eggs almost like the Cochin. The White Leghorn eggs were as white as snow. There was little if any difference between the eggs from Barred or White Plymouth Rocks and a cross of the two gave no apparent change in egg color. The same was true of Wyandottes. A cross of White Leghorn and Light Brahma gave a large egg almost chocolate in color—not a good market egg. A Buff Cochin and Light Brahma cross gave an egg almost like the pure Cochin in color, but more like the Light Brahma in shape and size. A White Leghorn and White Plymouth Rock cross gave a muddy-colored egg not prepossessing in appearance. The White Leghorn cross could be picked out in every case by the light color it gave the eggs. From many of these crosses the color was bad and would hurt the sale of the eggs. People like pure white or brown—an intermediate, undetermined color is against the eggs. Poultry men who practice cross-breeding should pay attention to this matter. Violent crosses—that is, a white-egg breed on one that lays dark eggs—gives a bad color while it may increase the egg-yield.

When to Sell Old Hens.—I aim to dispose of one-half of my hens every year and replace them with pullets in order to have a supply of eggs for my customers in the late fall and early winter months when hens are moulting. The hens are not sold until they cease laying and begin to moult ; and as they are only about two-and-a-half years old then, I have no trouble in finding purchasers for them who are willing to pay double or more what they would bring in market for laying purposes. When rearing chicks that are hatched in April, May or June, the cockerels are sold as soon as they can be picked out—usually when from three to four weeks old—mostly to parties who grow them up for home use, or for market. I consider Leghorns too small a breed to grow for market when hatched as late as the months named, which I find to be the best period for me to hatch and rear pullets for winter layers. I would advise farmers to dispose of their surplus stock early in the season—the cockerels as soon as they can be grown and fattened to marketable size, and the old hens as soon as they cease to be profitable as egg-producers. Then if a little care and attention are given to make them fat and in good marketable condition, most of them could be sold to advantage near home, as but few country towns and villages have even a decent supply of poultry for market during the summer months. If not able to dispose of all at home, crate and ship them alive to the city markets. A great many farmers seem to think that their surplus poultry can be sold only in the fall when buyers are picking them up for the Thanksgiving or Christmas markets, and when every one is ready to sell and prices are pretty sure to be low.

C. H. WYCKOFF.

Marketing Dressed Poultry.—Very many of the most successful poultrymen now sell their surplus fowls to special customers. The birds are well fattened, killed and nicely dressed, and delivered in clean, neat packages. In this way the birds are sold a few at a time, and the work of preparing them is not heavy. There is money in this system when a man is careful and has special customers for eggs or other produce. When

the fowls are to be sent to the city, it will probably pay best to send them alive, unless there are enough of them to make it profitable to hire plenty of help. In some cities dressed poultry is sold with heads off and drawn. In New York the heads and legs must be left on. Cutting off the heads is the quickest and most humane way to kill poultry. For New York the birds are killed by pushing a narrow keen knife through the roof of the mouth so that the bird bleeds to death. The knife should be thrust far back into the brain and thus cause less pain and hasten death. It is also well to stun the bird first by striking its head against a post or board. Before getting cold the birds are plunged into hot water and held there just long enough to warm them skin-deep, when the feathers will pull out easily and quickly. Care must be taken not to tear or bruise the skin in picking. "Plumping" follows. This is done while the carcass is still warm. It is again dipped in hot water and immediately plunged into very cold water. This hardens the skin and flesh and gives the bird a plump appearance. After "plumping" the birds are hung up by the feet in a dry, cool place till they are cold all through. In cold weather they may be shipped in boxes or cases with layers of rye-straw between the layers of poultry, or for extra-choice shipments each bird may be wrapped in white tissue or parchment paper. In warm weather ice must be used. In this case the poultry is shipped in barrels—a layer of ice at the bottom and the birds packed with backs outward all around and feet to the center, till a full layer is formed all around. Then the spaces are filled with ice and another layer put above, then more birds and so on. Poultry should always be sent by express.

A BATCH OF NEST-EGGS.

CHAPTER XVIII.

A FRIEND who invested in crushed glass for laying hens, found, after feeding it a few days, a sick pullet. Dissection showed the inside of the crop stuck full of bits of glass. A second, and in a few days, a third died, and the glass was taken out. He is not a very enthusiastic advocate of glass for "grit." There is nothing better than good, white, ground oyster-shells for grit and shell-material.

I had some very smart Brown Leghorn week-old chicks. When fed at night they seemed all right, but the next morning six were dead. After a good deal of study I opened them and found a kernel of Western corn in the gizzard of each, which was completely filled. The corn had been fed to the hen the day before, and it did not seem possible for the chicks to swallow any ; but they did and it was too much for them, swelling and souring before being digested.—C. E. CHAPMAN.

In my experience, dry food, such as rolled oats, cracked rice, wheat or corn, or a bread made of bran, Indian-meal and ground oats (sifted), together with pure water or milk (where it can be had), form the most favorable diet for young chicks, and last, but not least, they should have a grass-run. If they have plenty of shade and green food, and are not kept in too warm quarters, if raised artificially, they will not drink more water or milk than is good for them.—J. H. DREVENSTEDT.

There is no more pernicious practice than swapping males and eggs with neighbors whose flocks are no better than our own ; and the chances are that we will introduce into our flocks

some constitutional weakness or defect that they were free from. If the farmer feels too poor to buy a pure-bred male, let him pick the best specimen from his flock, then stock his breeding-pen from the best hens, having an eye to markings and laying qualities, and breed from them *only*. It would be much cheaper to buy a *good* male.

The *surest* way to improve your stock is to buy fowls rather than eggs. First-class birds for all practical purposes can be found on most poultry-farms and bought for little money, simply because they are not the best show-birds.

White fowls are not necessarily less hardy on account of their color. All fowls have a tendency to become white with age. The Light Brahma (nearly white) is one of the hardiest breeds we have. So is the White Leghorn. The majority of our white breeds are inbred more than the dark. The White Cochins are not extensively bred, and new blood is not so easily obtained as in the case of the other Cochin breeds, yet I doubt if birds of that breed, even with that drawback, are less hardy than the Black Cochins.

How Can We Fight Hawks?—A good shot-gun in the hands of an expert marksman will put an end to many of the pests; but unless the marksman can do nothing else, his time will be worth more at some other work. Bushes and underbrush for the chickens to run under are valuable. Pieces of glass or bright tin hung about in the sun will sometimes frighten the hawks away. Some persons make a hawk-trap by driving bright steel rods into a board, so that when the board is flat on the ground the rods stand upright. The upper ends of the rods are filed to a sharp point, and a live chicken is placed on the board among the rods. The hawk, plunging down to seize the chicken, pounces directly upon the sharp points. If he doesn't stick there he carries a painful memory away with him.

Here is what I use in the place of oyster-shells, and I will stick to it as long as I keep fowls in confinement. Give your fowls sand and plenty of it. I get a load of fine gravel, sift

through a coarse sieve, fill a wash-tub half full, and pump it full of water; then stir it with a broom and keep pumping till the water runs off clear. I dump the sand on a few boards to dry; when dry, I store it in the feed-room. Every morning when mixing the soft food, I put in two good handfuls of this sand to each dozen fowls, and if I notice any bowel disorder among them, I give an extra dose of sand. If I have any birds that show signs of becoming too fat, I separate them and give them sand. By following this advice you will never have any soft-shelled eggs.—E. O. THEIM.

Farmers should purchase fowls rather than eggs. One vigorous, hardy cockerel, not cock, is sufficient for 20 females, when allowed full liberty, which most farmers' fowls have. Let him take one home and at once make mince-meat of his old stock of males, or, better still, let him kill the old males before purchasing his fresh stock. Such birds can always be bought for about \$2.50 each. The second season purchase one or two more cockerels and kill off the old stock of hens. In-and-in breeding, when kept track of, is of advantage. The great trouble with most farmers when they inbreed is that all the earliest, most vigorous and finest specimens are killed for the market, while the farmer from year to year reserves for his breeding-stock of another season the scrub and stunted August and September-hatched chicks that the itinerant butcher wouldn't buy at any price. Every man who ever made a success of breeding fancy poultry has practiced and does practice in-and-in breeding to a greater or less extent; but all who are successful keep track of their lines of blood —P. H. SCUDDER.

How do you build your roosts? We want our roosts low, so that a hen can reach them without flying. It is not the business of a hen to fly or to run. We can make more by breeding any wish for either operation out of them. We want a roost at least two inches thick, oval at the top; the shape of bottom is of no consequence. We want the hen to rest comfortably, without being obliged to clutch the roost so desperately.

Cleaning Out the Poultry-House.—The work most dreaded by those who keep poultry is cleaning out the poultry-house, and as it should be done at least once a day in summer, those who are busy at some other occupation are not willing to bestow the necessary labor, and consequently neglect the work to a certain extent, thus inviting lice, which entail more labor, while the hens, being tormented by the pests, fail to lay, and the result is that they become unprofitable. Much of this trouble may be avoided by the use of board floors, which also protect the fowls from dampness in winter. With such floors the cleaning out of the poultry-house becomes an easy matter, only the sweeping the floor with an old broom being necessary. To do this, go to the poultry-house in the morning, taking a pail of dry earth with you. Carefully sweep off the floor, remove the accumulations, and then scatter the dry dust over the floor, placing the larger portion under the roosts. Do not be afraid to throw or scatter it over the nests, walls, or any other portion of the house, as lice do not relish dry earth, and if you prefer to use sifted coal-ashes, so much the better. The next morning, when you begin to sweep, you will find no difficulty, as you sweep the droppings away with the dust, and they will not stick to the floor. The work can be done as quickly as the sweeping of an equal area of the floor of the dwelling-house.

If you do not care for the droppings, you may use fine air-slaked lime freely occasionally, in place of the dust, as it will cause lice to scamper away, and will greatly aid in destroying disease-germs. If preferred, a handful may be mixed with the dry earth or dust. But when you use a board floor, do not forget that it provides a secure harboring-place for rats; hence have half-inch wire around the edge of the house, extending into the ground, and have boards of the floor removable.

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