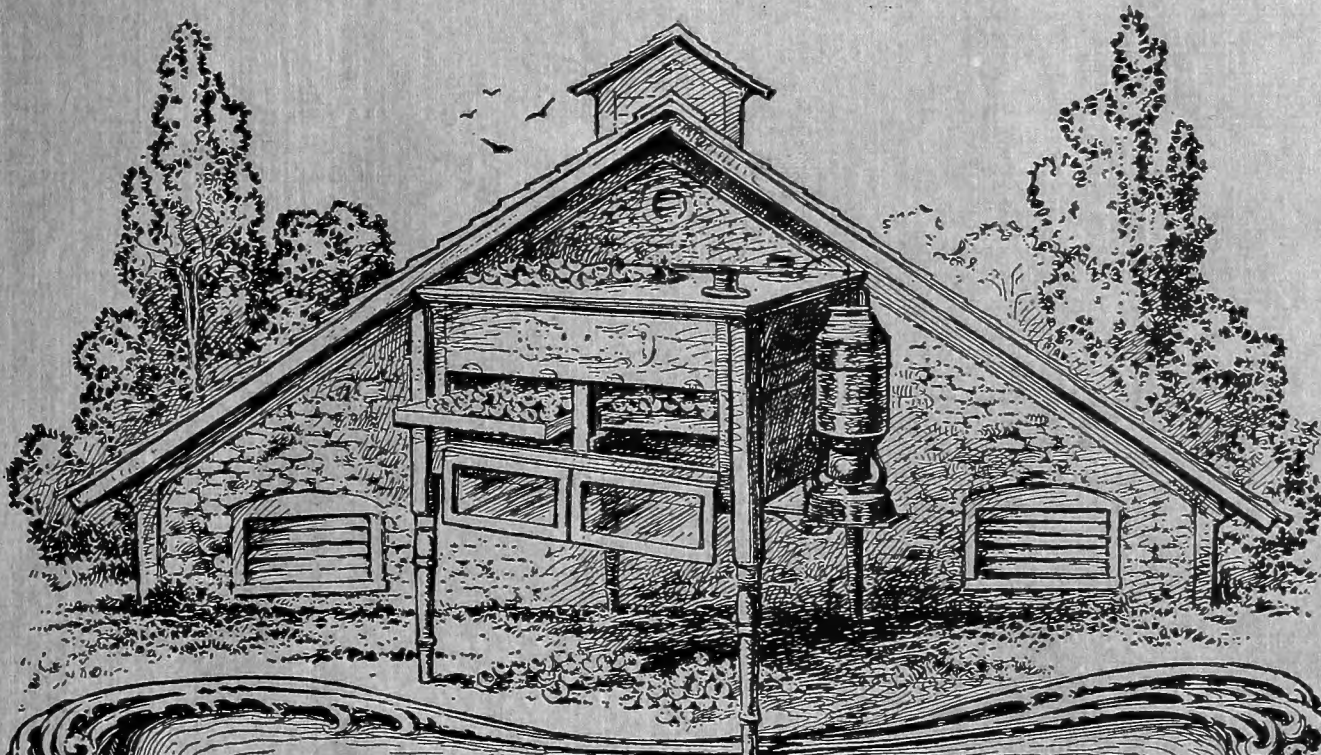
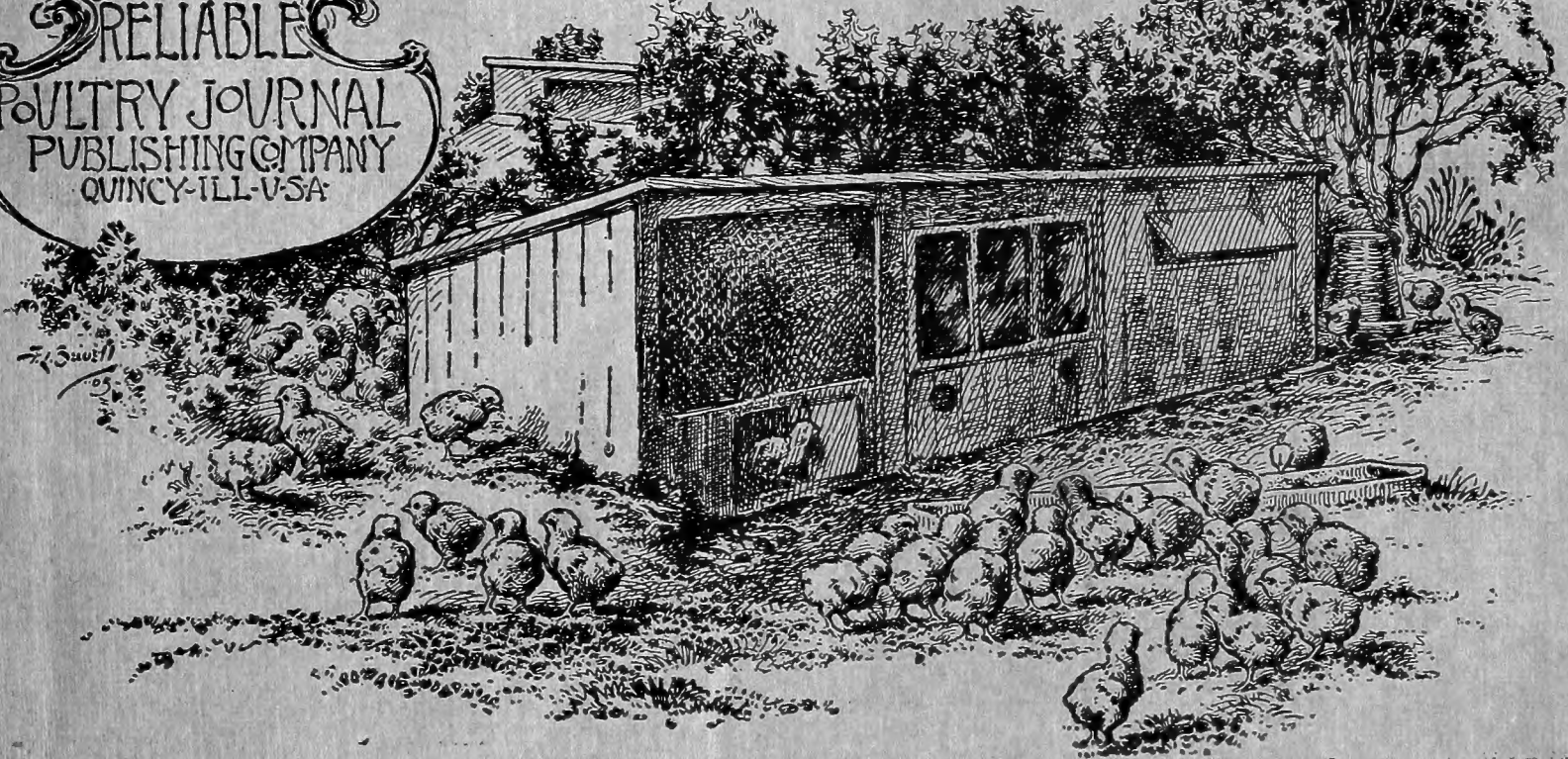


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ARTIFICIAL INCUBATING AND BROODING

RELIABLE
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ARTIFICIAL
INCUBATING AND BROODING

THIRD EDITION

The Successful Hatching
and Rearing of Poultry by Modern
Artificial Methods

FIFTY CENTS

QUINCY, ILLINOIS
RELIABLE POULTRY JOURNAL PUBLISHING CO.

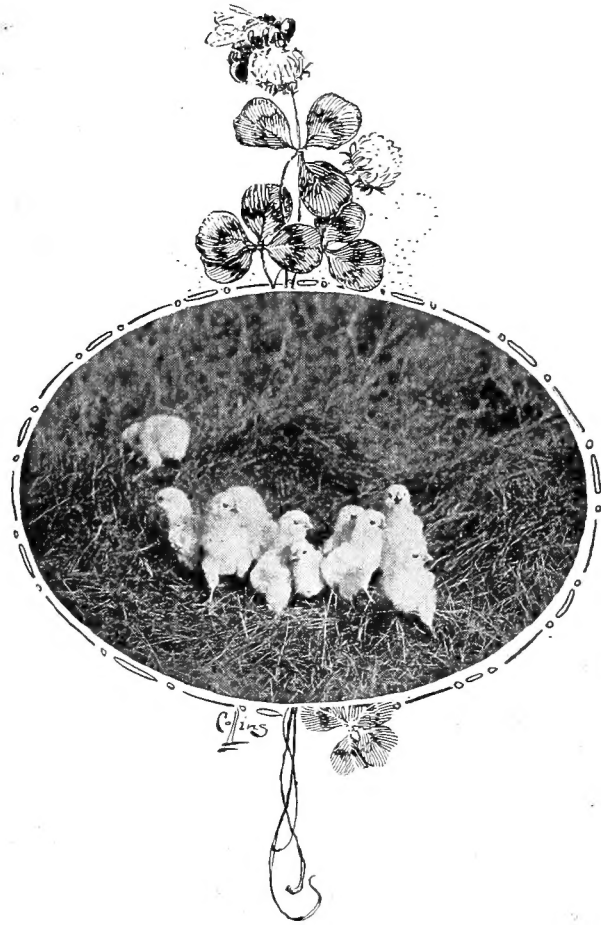
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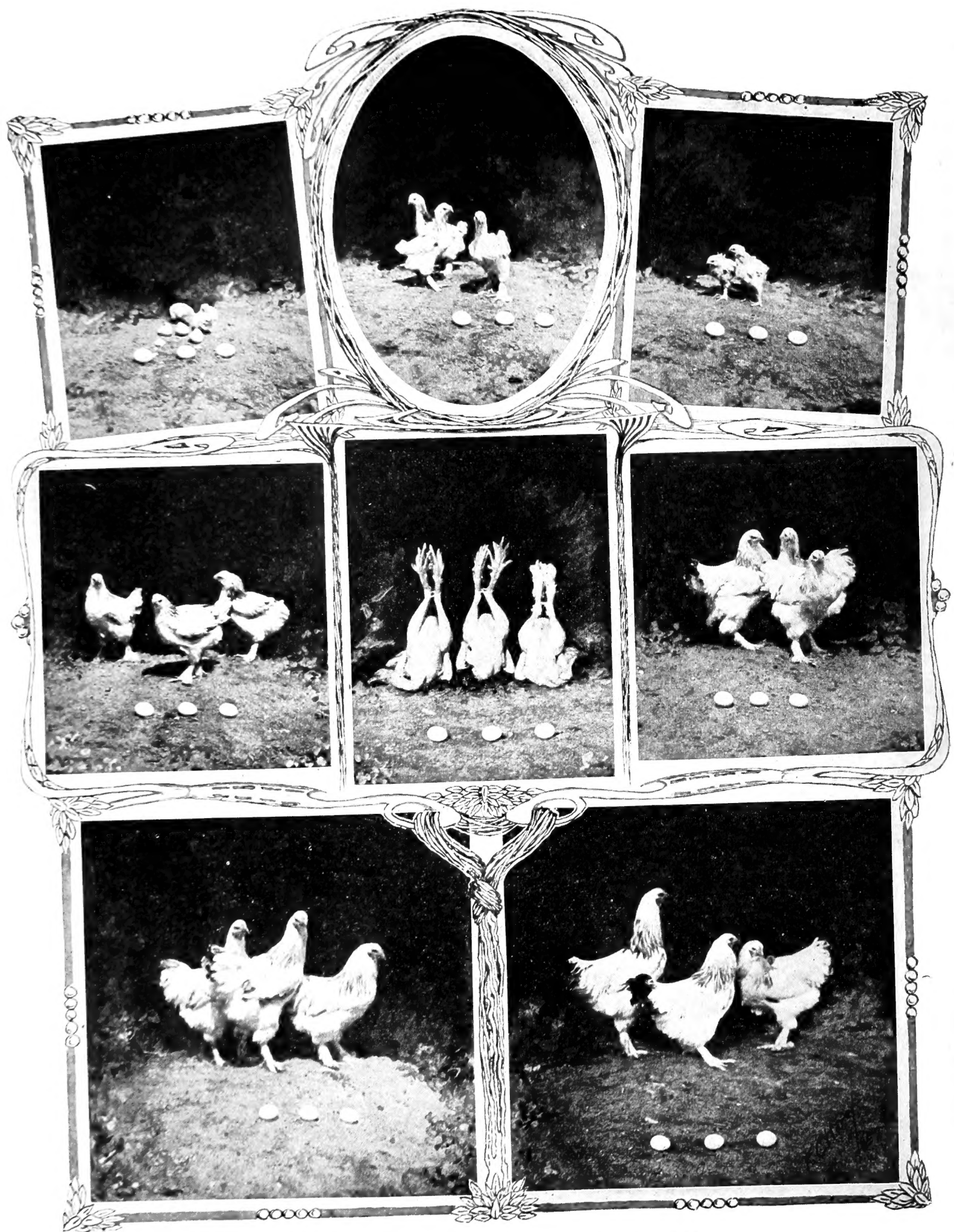
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SEVEN AGES OF SOUTH SHORE SOFT ROASTERS

PREFACE

Practical and successful incubating and brooding by artificial means have taken giant strides since the introduction to the first edition of this book was written, some six years ago. To-day popular sized incubators are used extensively in every civilized country in the world where poultry is grown for market. We thought we had large poultry plants six and seven years ago, and such was the case, but since that time still larger ones have come into existence, including, for example, the Stouffer Poultry Farm, Harrisburg, Pa., with a capacity of 100,000 ducks and broilers annually, using one hundred 300-egg capacity incubators; Yardley Duck Farm, Yardley, Pa., green ducks, broilers and roasters, using one hundred and four 300-egg capacity incubators; Oxford Poultry Farm, Oxford, Pa., capacity 50,000 green ducks per year, using seventy-four 288-egg capacity incubators; Earl Stock Farm, New Holland, Pa. using sixty-five 300-egg capacity incubators; Woodlands Farm, Iona, N. J., having 7,000 laying hens; Forest Lakes Poultry Farm, Browns Mills In the Pines, N. J., capacity 10,000 layers, using eighty-three 360-egg incubators; Hartman Stock Farm, Columbus, Ohio, using fifty-seven 360-egg capacity incubators; Emma B. Poultry Farm, Gurnee, Lake County, Ill., using thirty-two 360-egg incubators; Ledgewood Duck Farm, Norwalk, Conn., capacity 50,000 ducks per annum, using eighty-five 300-egg incubators; Weber Bros. Duck Ranch, Wrentham, Mass., capacity 45,000 ducks annually, and many other well-known farms of equal and less capacity.

Undoubtedly, America still leads in the size and output of its poultry plants, but foreign countries are recognizing the opportunity and embracing it. The fame of American incubators, brooders and poultry appliances has gone abroad and a number of our manufacturers make foreign shipments, others have foreign agents and a few find it profitable to maintain their own offices and warehouses in the largest foreign centers.

Five and six years ago comparatively little attention was paid to the poultry industry by the general and state governments; to-day the Bureau of Animal Industry is making extensive experiments and issues regularly valuable bulletins devoted to poultry exclusively, and in the neighborhood of thirty-five state colleges are conducting poultry plants on which they are making a systematic study of poultry and egg production, including the problem of successful incubation and brooding by both natural and artificial means. At several of these colleges annual poultry classes are conducted, with increasing membership, and numerous college graduates in poultry work are obtaining lucrative employment as managers of large market and standard-bred poultry plants.

But the greatest progress made by incubators and brooders in supplanting the hen as a hatcher and brood mother has been among poultry fanciers, farmers and farmers' wives. For many years fanciers held aloof from the use of incubators, fearing to trust their valuable eggs to them. At present, on the

contrary, there are a number of makes of incubators on the market that are so trustworthy in their operation and so correct in principle that they hatch as good or better chicks than the hen will produce, and, as a result, a majority of the poultrymen who produce fancy fowls are using nowadays one or more incubators. Until recent years many farmers have looked on an incubator as a mysterious contrivance or an ingenious plaything. Incubators on the farm are now quite common. Where persons used to look askance at a neighbor who made bold to buy a "tin hen," the purchase of an incubator is now looked on as a stroke of enterprise and the possessor of a good incubator is envied.

When it becomes known that a pair of chickens has been hatched in an incubator, raised in a brooder, fed on prepared chick food and brought to weigh 23 pounds dressed at six months old, and that the first prize birds at many of our largest shows are incubator-hatched and brooder-raised, prejudice against the artificial hatching and brooding of chickens and ducks dies a speedy death in the minds of progressive poultry raisers. The large poultry plants, the growth and present development of the poultry industry were impossible without the aid of good incubators and brooders.

The incubator has come to stay. The practical success of properly-constructed incubators and brooders is no longer questioned by persons acquainted with the facts. The invention and perfection of the small-sized portable incubator gave origin to what is now known as the poultry industry. Without these modern hatchers and artificial mothers the great duck and poultry ranches could not exist. It would be futile to attempt to hatch 5,000 to 100,000 ducks, broilers or roasters by the use of hens alone. A person can hatch 100 to 1,000 chicks by the hen method, though a large amount of work is involved, and the expense, labor included, is out of all proportion to the results. With incubators, on the other hand, the cost, labor included, is greatly reduced and profits increased.

One large-sized incubator, holding 360 hen eggs or 300 duck eggs, will do the work of 30 hens. Five minutes' time, morning and evening, will give the incubator all the attention it requires, whereas the work of obtaining 30 broody hens, providing nests for them, caring for them, dusting them with lice powder, seeing that they return to the right nests, cleaning the eggs and removing the broken ones, is a task that tries even the patience of a woman. The difference between the use of a modern, improved, automatic incubator and the use of hens, as herein briefly described, indicates the difference between present up-to-date methods and old-time conditions that were in force before what is now called the poultry industry existed. The successful incubator and brooder, therefore, have come to stay and are highly important factors in the upbuilding of a great industry.

INTRODUCTION



PERSON who is at all well informed will not dispute the claim that the poultry business in the United States is now an important national industry. As a matter of fact, it is one of the most important, not alone in this, but in every other civilized country, for poultry and eggs are much esteemed the world around as a highly nutritious and palatable human food. These

articles are admitted to have only one rival as a natural, complete and nutritious food, namely, milk and milk-products. The poultry industry rests solidly upon the actual value of poultry and eggs as food and will endure, therefore, as long as mankind exists. Its future will be identical, in a true sense, with that of the human race. Increase of population will mean a corresponding increase in the production of these well-nigh indispensable food products.

Just how much the modern incubator and brooder have had to do with the recent rapid development of the poultry industry in this and other countries is hard to estimate, but unquestionably they have been one of the most important factors. Hatching chickens by artificial means is almost as old as history, for it was practiced before the dawn of the Christian Era and has been practiced continuously in Egypt, China and other oriental countries down to the present day. For an authentic account of how hen eggs are hatched at present by artificial means in Egypt, see report of the United States consul in the following pages. For many years past, in fact, during at least three or four centuries, chickens have been hatched artificially in European countries, notably in France, England, Belgium and Denmark; but it has remained for Yankee genius to modernize and practically perfect the present popular-sized incubators and brooders and to devise ways and means of hatching and raising chicks in large numbers by their use on the city lot, the village acre and the ordinary farm.

There is no longer room to doubt that the incubator and brooder method of hatching and raising chickens and ducklings is a marked improvement over the hen method. It is an improvement in the sense that it is cheaper, also that it is better, also that a far greater number of chickens and ducks can be raised by the use of incubators than could profitably be raised with hens. The reader of this book will learn that broiler plants now exist and are being successfully operated in this country where thousands of chickens are raised in limited quarters by artificial means, and that duck ranches exist and are in successful operation where from twenty to fifty thousand ducklings are raised each season. All these chickens and ducklings are produced by artificial means and it would be practically impossible to produce the same number by the hen method. To do so would require many acres of land, thousands of square feet of building and a small army of men and women to take care of the hens. The invention and perfection of the modern incubator has made all this possible, hence so far as the market poultry business is concerned, it owes a very great deal to artificial incubating and brooding.

When we come to consider the incubator and brooder on an ordinary farm, the thought suggests itself and gradually takes the form of actual belief that sooner or later the incubator and brooder will supplant the hen as a sitter and mother in the production of poultry, for it is well known that on hundreds, yes, thousands of farms, taking the country over, the hen method has already been abandoned by the farmer and his wife, and incubators and brooders are being used simply and solely because they do better work with less labor, hence are more profitable. The number of farms on which this condition exists is

increasing from year to year and the question arises, "How long will it be before every intelligent and progressive farmer or farmer's wife who wishes to better his or her condition, will find other and more profitable work for the hen to do than to sit on her eggs and serve as mother to a brood of chicks for a number of weeks, and will call to their assistance the artificial hen and mother—modern inventions that are able to do the work better and cheaper?"

We believe it is only a question of a comparatively short time when the American hen will be used almost exclusively for the production of eggs, rather than have her valuable time wasted in doing work that can be done better and cheaper by artificial means. The hen has a monopoly in the production of eggs. We can hatch her eggs for her and raise her chicks, but we cannot manufacture eggs that will hatch. She will always be in demand, therefore, and it is plainly to the advantage of poultry keepers to use her exclusively for egg production.

The following extract is taken from a report on artificial incubation and the annual egg yield per hen, appearing in the United States Statistics of Agriculture for 1902, based on the census of 1900, published by the Department of Agriculture, Washington, D. C.:

"The continued use of the incubator tends to make the hen forget, in a measure, her maternal instinct. This fact assumes gigantic importance when it is remembered that it has been discovered that there are 600 embryo eggs in the ovary of the hen. It has been further ascertained that two-thirds of this number can be secured in the first two years of the hen's life, provided suitable measurers are employed. If the tendency to become 'broody' can be suppressed and more time can be given to egg laying, incubation being left to the artificial incubator, and if, in addition, egg producing food be fed, the problem of getting the greatest number of eggs from the hen in the first two years of her life will be very near solution."

The question is, how many of these 600 embryo eggs can we coax out of record layers during the first two years of their laying period, meaning from the time they are six months to thirty months old? That is the important point for practical poultrymen to consider, and clearly it is one of absorbing interest and far-reaching importance.

Do we rightly appreciate the importance of this question? Let us see if we do. The government statistics, based on the census of 1900, report that the average egg yield per hen on the farms in the United States during the year 1899 was 5 5-10 dozen, or sixty-six eggs per hen.

On the other hand, Prof. G. M. Gowell, of the Maine Agricultural Experiment Station, reports that by proper feeding, by the use of trap nests which unfailingly record the best layers of a flock, and by discarding the poor layers, they have produced a hen with a record of 251 eggs in 365 days and scores of them with records ranging from 200 to 251.

Notwithstanding the improvement made in the past five years, it is doubtful if the average hen on the average American farm, where she is still used as a sitter and mother, lays to exceed one hundred eggs during three hundred and sixty-five days; indeed, it is doubtful if she lays more than six or seven dozen eggs during the year. Poultrymen the country over have repeatedly demonstrated that an average flock of standard-bred fowls can be induced to lay from one hundred and fifty to two hundred eggs per year, under proper treatment. When we consider that the hens of America laid during the year 1890 over six hundred million dozen eggs, we obtain a glimpse of the national loss resulting from the average hen laying only seventy-five to one hundred eggs per year, when she could have

INTRODUCTION

been induced to lay twice that number. As this country doubles and trebles in population, all such losses as this will be carefully looked after and scientifically treated. This means, if it means anything, that the poultry industry will increase and develop along systematic lines and the incubator and brooder will be called into very general use.

The writer of these lines has traveled upwards of seventy-five thousand miles during the last 12 years, visiting poultry plants, large and small, and during this time has made a careful study of different branches of the poultry business. Long strides have been taken during even this short period until at the present time we hear it commonly said, "The incubator is now a practical success. It is no longer any trouble for a person of ordinary intelligence and careful habits to hatch chickens in large numbers by the use of incubators, but it is not so easy a matter to raise them." This is true, and it isn't true. It is a singular fact that for every three people who can be found who will say, "Oh, yes, I hatch them all right, but I do not have very good success in raising them artificially," one person can be found who will say, "I cannot hatch them so well with incubators as I can with hens, but I can raise them in brooders much better than I can with hens."

This simply means that different methods are employed, some of which are right and others wrong. It means simply that up to the present time more careful attention has been given by experts to the work of perfecting the incubator and demonstrating the proper use of it, than to the equally important work of perfecting brooders and brooding systems and solving the problems of their successful operation. But at the present time this is changed and as the incubator nears perfection much time and thought is being given to proper brooding devices, and with excellent results. The fact that many people in this country to-day are hatching eggs under hens and then placing the chicks in brooders to be raised artificially, is complete proof that chicks can be raised in brooders as well or better than they can with hens, and that the brooder is as much an improvement over the hen as an incubator is an improvement on the hen as a hatcher. It is a question merely of knowing how, and that demand is what called forth this book.

Admittedly our equipment of tools at present is by no means complete and we have mastered only the first principles of the production of poultry and eggs in large quantities as an independent enterprise. The improvement of the utility breeds, the invention of popular-sized, portable incubators and brooders and the designing of suitable brooding houses have given us a fair start, and we may look forward with confidence that great progress will be made during the next few years. No man can safely set a limit to what will be accomplished in this direction within the next decade. Ten years ago the poultry business in this country, as an independent business, was insignificant as compared with present achievements, but there is good reason to believe that the next ten years will show still greater progress. It cannot well be otherwise. Where one man was interested in the problem and trying to achieve results ten years ago, one hundred or more are now employed at the same task. To-day America leads the world in the knowledge and employment of successful methods of poultry production on a large scale, and probably it will maintain this position. Other countries are adopting our methods but we have secured

a lead that will be hard to overcome. The financial risk is being eliminated from the business until it is not greater now than that involved in other business enterprises, and men of means and brains are taking up the work in rapidly increasing numbers.

Naturally, as poultry production became a distinct and important industry, it was divided into branches representing special lines of effort. Mankind had entered upon an age of specialties and the poultry industry did not prove an exception. First, the growers of poultry were merely poultry keepers; now we have fanciers, duck growers, egg farmers, broiler raisers, etc. The development of these branches has been rapid, but not unnaturally so. It was natural that this development should result from special attention, special effort and singleness of purpose. The practical result has been that we now have thousands of fanciers, including hundreds of specialty breeders, and where, at the beginning, there was only one variety of fowl, a black and brown wild bird of the jungle, to-day we have more than one hundred separate and distinct varieties; where twenty-five and thirty years ago the common puddle duck, weighing three to four pounds, was the best this country produced, we now have the Imperial Pekin, weighing ten pounds to the pair at ten weeks old, and ten to fourteen pounds each as adults, and have numerous "ranchers" who produce from five to sixty thousand ducks annually and find for them a ready and profitable market; where three or four decades ago a flock of one hundred or more hens was a curiosity and the egg basket was seldom larger than a man's hat, we now have egg farms that each carry from one to ten thousand laying hens, and the eggs are gathered in bushel baskets, five to twenty baskets being required to gather the average daily yield, and where only a few years ago broilers, squab broilers, roasters, winter chickens and capons were strange words, because seldom used, they are now common expressions, while tons upon tons of expertly produced poultry meat are consumed daily, and we have made only a fair start.

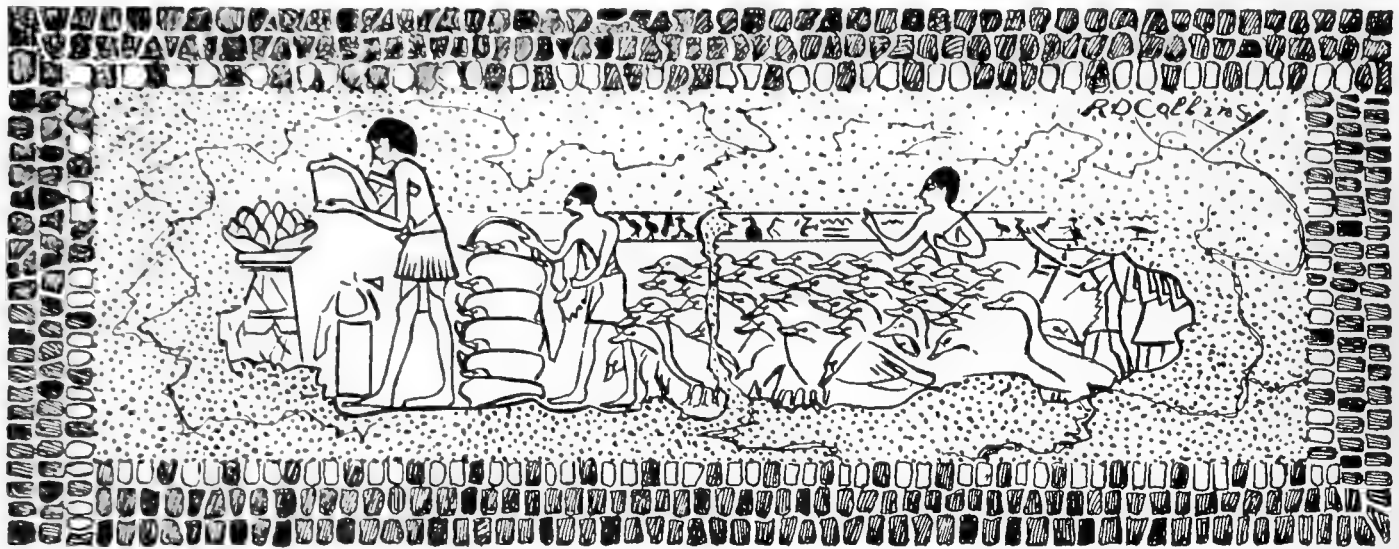
The fancier, first and last, despite his "fuss and feathers," has been our good friend. What we have wanted, and asked for, he has supplied. We asked for a "general purpose" fowl, and he gave us the Plymouth Rocks. We asked for more eggs, and he gave us the "200 eggs per year hen" of several varieties. We asked for better squab-broilers, broilers and roasters, and he gave us the Wyandotte. We asked for more meat and this demand was soon supplied by increasing the weights of the Asia-tics, by deepening the keels of Pekin ducks and by the production of Mammoth Bronze turkeys and Toulouse geese that tip the scale at twenty to forty pounds each.

We have endeavored in this work to provide the most reliable information to date for the guidance of persons who wish to use from one to one hundred incubators and from one or two brooders to the brooding and raising of thousands of chicks and ducklings by artificial means. The contributors are noted poultrymen and women—men and women who write from practical, successful experience. Each may select the method best suited to his circumstances, feeling confident that close attention to details and strict guard kept on expenses will bring success.

EDITOR.

Quincy, Ill., April 1, 1906.

ANCIENT ARTIFICIAL INCUBATING



EGYPTIAN INCUBATORS

SEMI-OFFICIAL REPORT OF THE UNITED STATES CONSUL AT CAIRO, EGYPT,
SETTING FORTH INTERESTING AND SURPRISING FACTS REGARDING THE
STATE OF ARTIFICIAL INCUBATING AND BROODING AS PRACTICED AT THE
PRESENT DAY IN THE COUNTRY OF THE NILE



IT IS quite generally known that the hatching and raising of chickens by artificial means was first practiced in Egypt. The fact now develops that artificial incubating and brooding is still extensively practiced in Egypt. Some time ago Mr. F. W. Judd, of Michigan, wrote to the United States Consul at Cairo, Egypt, asking for information on the subject of artificial incubation in that country to date. In due time he received through the foreign or consular department at Washington a lengthy and carefully prepared report, accompanied by three drawings, outlining the ground plan of a present-day Egyptian incubatory and two sectional views of same, showing the interior construction and arrangement.

From this report we learn that the Egyptian hen, in many, many cases, has abandoned the work of sitting on eggs for purposes of incubation. In other words, her instinct to do this has become extinct in a majority of cases. If we want a hen to lay eggs and do nothing else for a living, she will accommodate herself to our wishes. Not only has she shown this disposition in Egypt and China, but in this country as well. About four years ago Mr. Redkey, of Ohio, who used incubators exclusively during eight years only, reported that he noticed a decided falling off in the broodiness of the sixth, seventh and eighth generations of hens produced in this manner. Possibly he was mistaken, probably not. Since then a number of prominent poultrymen have come to the same conclusion, that the tendency to broodiness can be bred out of a strain. Following are the semi-official report and drawings, presented under copyright, all rights being reserved:

REPORT OF THE U. S. CONSUL AT CAIRO

The artificial hatching of eggs has been so long practiced in Egypt that the hens have completely abandoned that part of their work to man. It is a regular industry and the professors

form a very close corporation, handing down their secrets from father to son. For three months of the year their time is completely absorbed by constant attention at the incubatories.

Although very successful in the work, they never attempt the hatching except during the months of February, March and April. The minimum temperature in Egypt is reached on the 20th of January; after this it steadily rises, and by Easter the hot weather may be expected. This makes the process difficult and the ovens are therefore closed for the year.

The population of Egypt is very dense, about 700 per square mile. This agglomeration fosters the use of large incubatories, turning out each one from 300,000 to 600,000 chicks each season. In some villages there are from three to five of these establishments. They are generally near to some important market place, and each one apparently in the center of a district of about 50,000 population. That is, each one is the center of a circle having a radius of five miles. It is this density of the population that has allowed this system of artificial hatching to become so very successful. At the same time it must be remembered that there is no other, as the native hen never sits on her eggs.

Another important point is that the hatchers do not attempt to rear the young broods. Forty-eight hours after the chicks emerge from the shell they are scattered over the country; overcrowding is thus prevented. This distribution is effected in a very simple manner. As the incubator is near a market place, word is sent there that on such a day there will be so many young chicks. This news is quickly disseminated among the villages, and on the appointed day the women arrive with their cages and purchase the young chicks, which are generally sold by the hundred for about \$1.50 per hundred. There are also a number of brokers or dealers who take the young chicks to the more distant villages. For this they have cages made from palm branches. They are divided into two stories, each of which is divided by a partition, so that the smaller divi-

ANCIENT ARTIFICIAL INCUBATING

sion only contains about 250 chicks, thus preventing overcrowding. Two such cages will transport each 1,000 young birds, so that a man with a donkey easily manages 2,000 of them, and by nightfall has probably sold the entire lot at a distance of five or six miles from the establishment.

Once in the village the chicks become the property of the women, who take great care of them during the first week. For two or three days they are kept in cages in lots of twenty or thirty and fed on broken grains slightly moistened. At night the cages are taken into the houses and sometimes covered with a bit of cloth. After these first few days the young birds are strong enough to forage for a living; they are then allowed to roam about freely and at night are kept in a sort of oven placed in a corner of the courtyard. This oven is made of unburnt clay and in shape is like the letter U laid on one side—see drawing. The top is slightly perforated. The entrance is closed by a heavy stone to keep off foxes and other vermin.

When the young chicks are fairly feathered they are plucked perfectly clean and slightly greased. This adds greatly to their health, but detracts much from their beauty. It strikes a stranger as something extremely novel to see hundreds of perfectly naked chickens basking in the sun or running about.

It is difficult to get any exact figures as to the number of these incubatories, but judging from those personally known to me, and their distances apart, I should estimate the number at 150, with an average production of 300 000 per season. This estimate must be well within the mark, as the population of Egypt is nearly 7,000,000 and fowls form a very large part of the Egyptian diet, so that 45,000,000 eatable fowls would be a short supply.

The ordinary form of the incubatories is an oblong 100 feet in length by 60 feet in width, the height varying from 12 to 15 feet. Ill. 1, though not drawn exactly to scale, shows the general arrangements. The outer chamber A is divided into three rooms, the middle one masking the entrance to the ovens and thus excluding the outer air. The door leading from A into the central hall is very small. B represents the ovens of the upper tier. C is the man-hole; the attendant stands in this and manipulates the eggs. D D are spaces in the central hall for the reception of the young chicks. These spaces are marked off by ridges of dried mud about 9 inches in height. Fig. 3 is a door giving access to the interior of the oven. Around the walls and parallel to it runs a raised ridge 6 inches in height; between this, and the wall the fires are lighted. In the top of the dome is a small aperture about 2 inches square for the exit of smoke and regulating the heat.

The outer wall, 4 feet thick, is generally built of sundried bricks, the mortar simply mud. The space contained within the walls is divided as shown in Fig. 1. The circular ovens are built up and the spaces between them and the wall filled in with brick and mortar, the same as the outer wall. Each set of ovens, the upper and lower, is perfectly independent and is covered by a dome having a very small aperture in the crown.

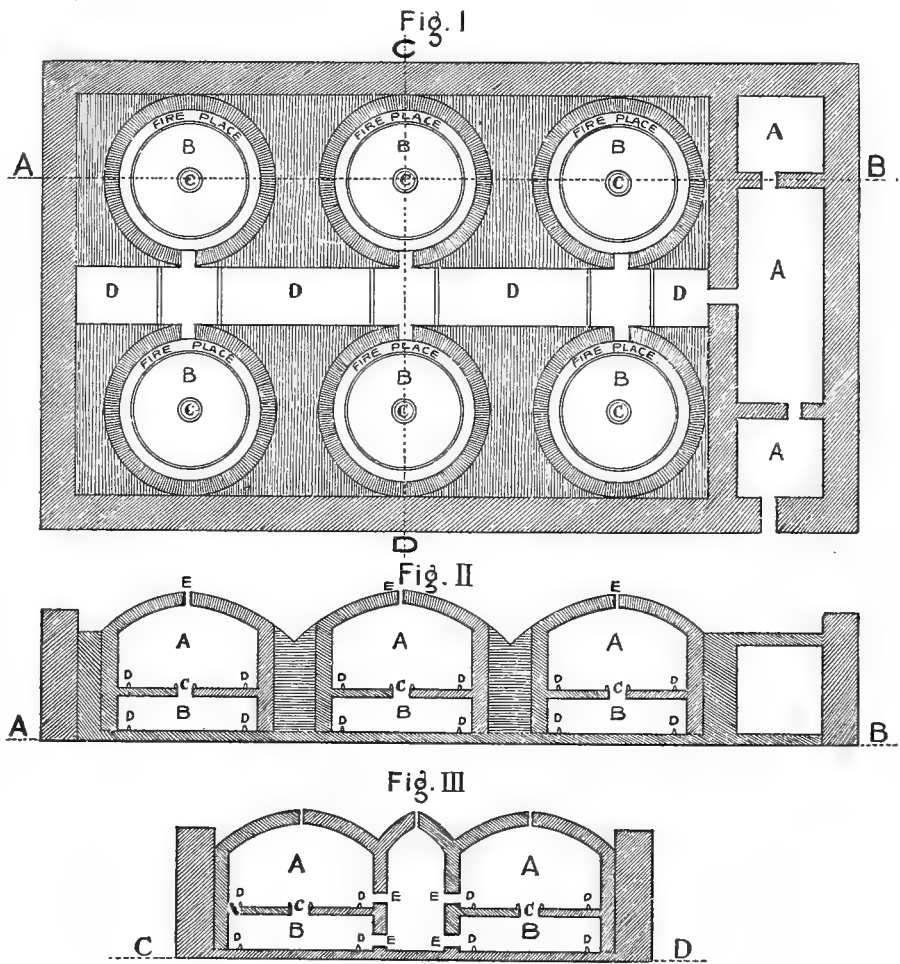
Fig. 2 represents the elevation on the line A B of Fig. 1. The height of the lower oven is 4 feet, that of the upper one 9 feet. The interior diameter between the ridges D D is 15 feet.

Fig. 3 represents the elevation on the line C D of Fig. 1, and shows the disposition of the central wall and the doors of the

ovens. For this particular incubatory the attendants consist of two men and a boy.

In the month of January, about the 10th, fires are lighted in all the ovens and on the floor of the central hall. The entire building is thoroughly warmed to a temperature of 110 degrees Fahrenheit. This heat is continued for three weeks, when the temperature is allowed to fall to 100 degrees Fahrenheit.

The fires are at first composed of gelleh or dried cow dung, but when the eggs are placed in the oven coarse broken straw, mostly the joints, and sheep or goat dung is used. The fuel is placed in the trough between the hall and the ridge, and is lighted at one or more places, according to the degrees of heat required. This is the only means of regulating the heat. Ther-



1—PLANS OF EGYPTIAN INCUBATORY

Fig. I—Ground plan. A A A, rooms masking entrance to incubatory. B B B, ovens where eggs are hatched. C C, manholes admitting attendants to upper tier. D D, hallway. Fig. II—Sectional view lengthwise. A A A, upper chamber to ovens. B B B, lower chambers. C C C, manholes. D D, fire spaces. Fig. III—Sectional view lengthwise—same lettering as for Fig. II.

mometers are not used. The attendants endeavor to keep the heat a trifle greater than that of their own skin.

While the oven is being warmed, notice is sent out to the villages that the establishment will purchase eggs on such a date. The country people arrive with large crates containing from 1 000 to 2 000. These are purchased outright by the establishment at the rate of \$4 per 1,000.

The floor of the oven is covered with a coarse mat made of palm leaves; on this a little bran is sprinkled to prevent the eggs from rolling. The attendant changes the position of the eggs twice a day, taking those from near the manhole and placing them on the outer edge of the circle, and vice versa. At the end of six days the eggs are held up one by one towards a strong light. If they appear clear and of a uniform color, it is evident that they have not succeeded; but if they show an

ARTIFICIAL INCUBATING AND BROODING

ADDITIONAL FACTS

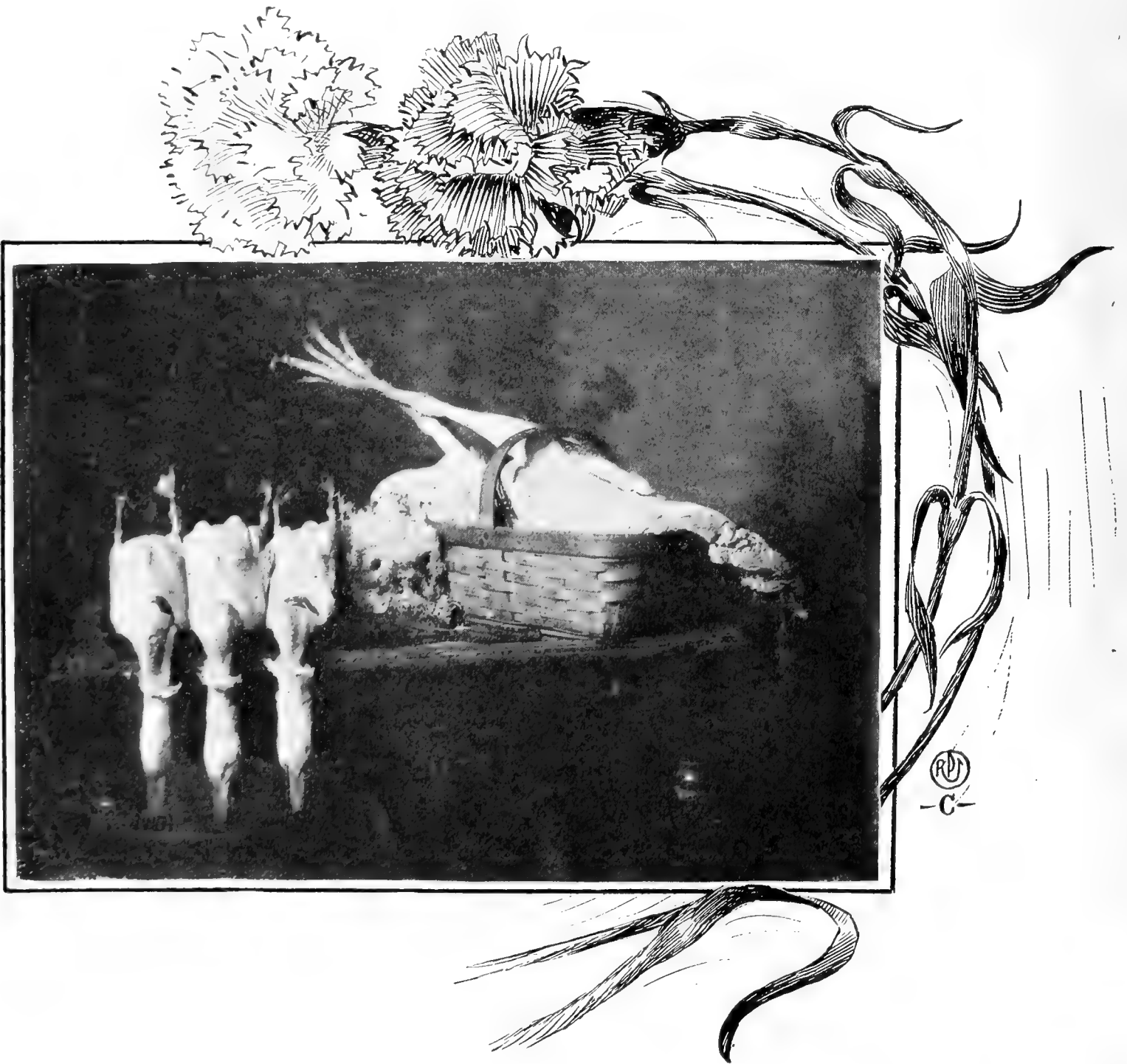
opaque substance within, or the appearance of different shades, the chickens are already formed. The bad eggs are removed and the others are continued in their places for four days; at the expiration of this time they are again examined and put back into their places, the same continual shifting from the inner to the outer part of the circle being observed. The doors of the ovens are kept hermetically closed by a small plank well caulked. This is removed in the forenoon and afternoon and once during the night to see that the heat is kept at the proper point.

After the eggs have been fifteen days in the ovens they are daily examined, and so delicate is the touch of the attendant that he can at once distinguish if the egg is alive by the fact that it should be slightly warmer than his own skin.

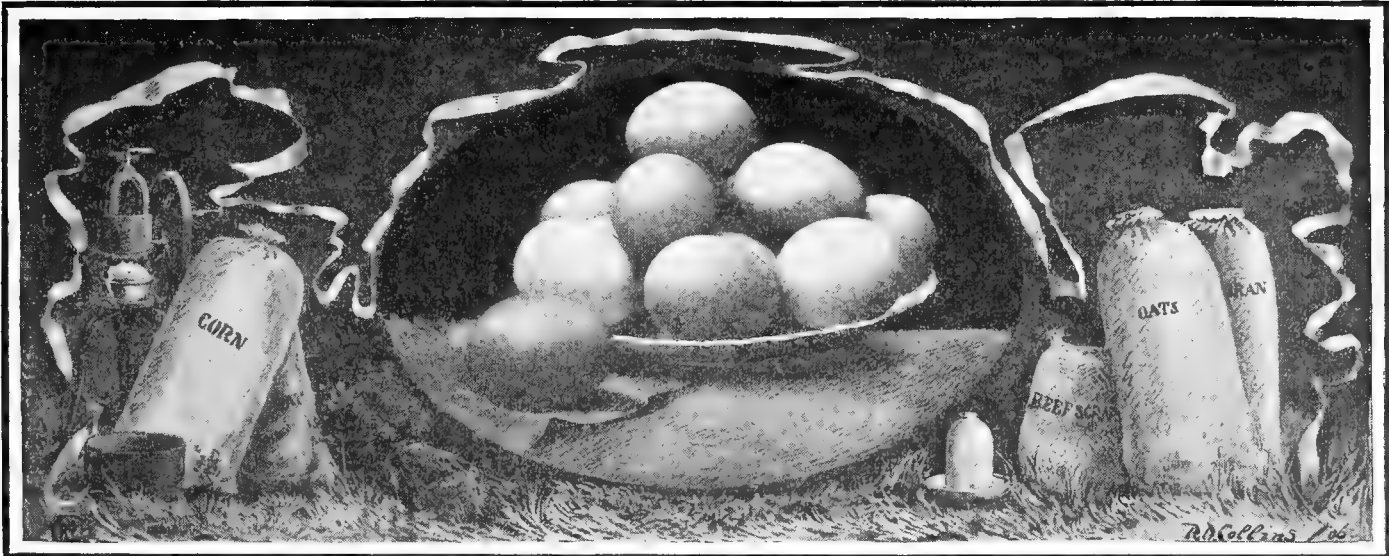
At the expiration of twenty-one days the chicks commence to emerge from the shells, the attendants constantly aiding them. They are placed in the spaces D D, Ill. 1, and left to dry for nearly forty-eight hours, but they are not fed. The sale then commences and in a few hours they are spirited away. The temperature in the central hall is maintained at 98 F., and that of the ovens slightly more

"The Egyptian incubatory of to-day is but a reproduction of the one of thousands of years ago. In all these years the Egyptian breed of chickens has not changed, and the manner of reproduction has remained immutable. Not long since I secured the metal stamp of a chicken, deposited in a tomb over two thousand years ago, and it is a perfect type of the Egyptian fowl of to-day, and when this stamp was struck, artificial incubation was a thing of actual existence in Egypt.

"Not only are the eggs put through the process of incubation more cheaply here than anywhere else in the world, but chicks are reared at an expense past comprehension, while disease and natural death among fowls, because of tireless care are almost unknown. One man and a boy are the sole attendants of the incubatory I explored * * Think of 234,000 chicks owing life alone to the tender care, in three months' time, of an old man with most defective eyesight and a 16-year old boy, and some conception may be had of the economies of this Egyptian industry."—U. S. Consul General Cardwell, *Scientific Am. Supplement*, No. 29, 1890.



THE EGG AND ITS GERM



A PRACTICAL STUDY OF EGGS

A NON-TECHNICAL PRESENTATION OF THE FORMATION AND PRODUCTION OF EGGS—THE CAUSE OF DOUBLE-YOLKED, SOFT-SHELL EGGS AND CROOKED EGGS, ONE EGG WITHIN ANOTHER, ROTTEN NEW-LAID EGGS, ETC.

G. BRADSHAW



ALTHOUGH eggs are a common article of food there is not a general knowledge amongst poultrymen as to their formation. The shell or envelope is white or colored according to the breed which produces it, and is composed of carbonate of lime, phosphate of lime, and animal gluten; salts of lime causing the particles to adhere. Soft eggs are either eggs without a shell,

or the shell may be so thin as to feel soft through the deficiency of salts of lime. It is a matter of surprise where a hen finds all the lime necessary, for if she lays 150 normal sized eggs in the year she will have produced two pounds of pure carbonate of lime.

HENS ARE WONDERFUL CHALK MAKERS

Mr. P. L. Simmonds F. L. Z., on this subject in the Journal of the Society of Arts, says:—"If a farmer has a flock of 100 hens, they produce in egg shells about 137 pounds of chalk annually, and yet not a pound of the substance, or perhaps not even an ounce may be found on the farm. The materials for the manufacture are found in the food consumed, and in sand, pebbles, brickdust, pieces of bone, etc., which hens and other birds are continually picking from the earth. Their instinct is keen for these apparently innutritious and refractory substances, and they are devoured with as eager a relish as the cereal grains or insects."

If hens are confined to barns or outbuildings, it is obvious that the egg-producing machinery cannot be kept long in action, unless materials for the shell are supplied in ample abundance. If fowls are confined in a room and fed with any of the cereal grains, excluding all sand, dust or earthy matter, they will go on for a time, and lay eggs, each one having a perfect shell made up of the same calcareous elements.

THE SHELL IS A "SIEVE"

The shell is porous to such an extent that when examined

by a microscope it has quite a sieve-like appearance, and is permeable by the air, otherwise the chicken could not live during the incubating period.

This porosity of the shell, although absolutely necessary when the eggs are to be incubated, is detrimental when such have to be used as an article of food from the fact that by means of these minute perforations there is a continual evaporation, so that from the time the eggs are laid until consumed there is a wasting and deterioration of the contents, the extent of which is dependent on the temperature and other conditions under which they are kept, it being very well known that eggs deteriorate much quicker in summer than in winter.

FORMATION AND PRODUCTION OF AN EGG

Anyone, upon opening after death the body of a hen, will find a cluster of eggs in formation much like a bunch of grapes, and called the ovarium (see illustration.) These, however, are but rudimentary eggs, and I have counted as many as seventy in one bunch, and are in size from a pin's head to the full-sized yolk of an egg. Each of the eggs is contained within a thin transparent sac and attached by a narrow pipe or stem to the ovary, and during the laying period of the hen these eggs are maturing and thus keeping up the supply which she lays.

These rudimentary eggs have neither shell nor white, consisting wholly of yolk, on which floats the germ of the future chicken; and as they become larger and larger they arrive at a certain stage when, by their own volition, weight, or other cause, they become individually detached from the bunch and fall into a sort of funnel leading into a pipe or passage called the oviduct—this organ in the hen being from 22 to 26 inches long.

THE COATING OF ALBUMEN

During the passage of this egg or ovum to the outer world it becomes coated with successive layers of albumen—the white—which is secreted from the blood-vessels of the oviduct

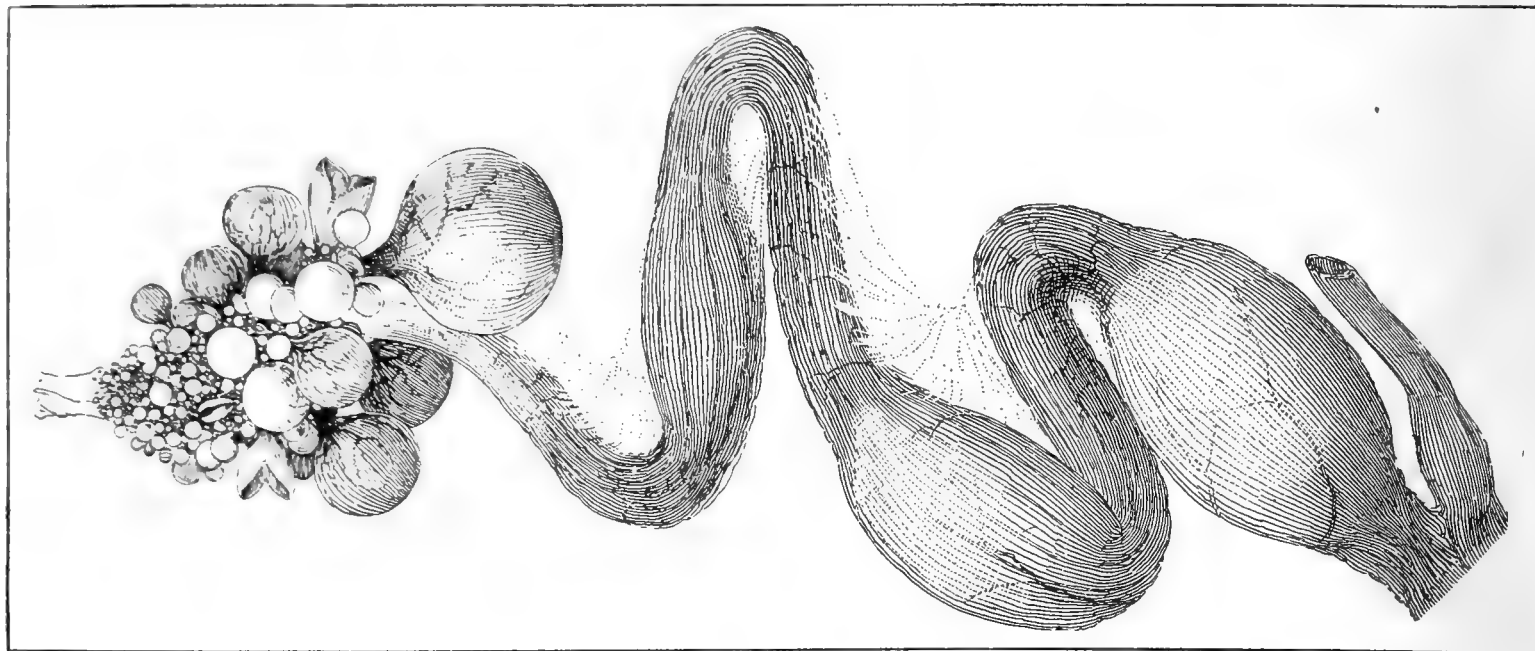
ARTIFICIAL INCUBATING AND BROODING

in the form of a thick glairy fluid, and is prevented from mixing with the yolk by the membrane or sac which surrounded it before it became detached from the cluster. It is also strengthened by a second and stronger membrane, formed around the first immediately after falling into the funnel, and having what is like two twisted cords of a more dense albuminous character, called by anatomists chalazae which pass quite through the white at the ends, and being, as it were, embedded therein, thus preventing the yolk and germ from rolling about when the egg

is duplicated as well as the yolk. Should these yolks be fertilized and the egg hatch, we get the occasional four-legged or other chicken monstrosities.

SOFT-SHELLED EGGS

A further result of stimulating food is varied from the above when the ova mature in excess of one a day. In place of falling into the passage in pairs, as above, the two drop in separately but on the same day. This results in soft eggs, not from



2—OVARY AND OVIDUCT OF A HEN

is moved, and serving to keep the germ uppermost, so that it may best receive the heat imparted during incubation.

THE AIR CHAMBER

It is during the passage of the egg through the lower part of the oviduct that it gets covered with the two skins which are found inside the shell. These, although lying close around the egg, at the thick end become separate, and form what is called the air-bubble or chamber. This, in newly-laid eggs, is a mere speck, and is that portion which shows the result of the evaporation previously referred to. This speck of air space becomes daily larger as the egg gets older, and is frequently equal to one-fourth of the entire egg. This egg-chamber, if perforated with the finest needle will prevent the egg hatching.

When the egg has advanced more than half-way down the oviduct, it is still destitute of shell, which begins to be formed by a process of secretion, and when about completed the various shades of brown and tinted coloring matter are imparted in those breeds in which colored eggs are peculiar; sometimes in very brown eggs white spots appear, but which can readily be rubbed off. When the shell and coloring are complete the egg continues to advance along the oviduct till the hen goes to the nest and lays it.

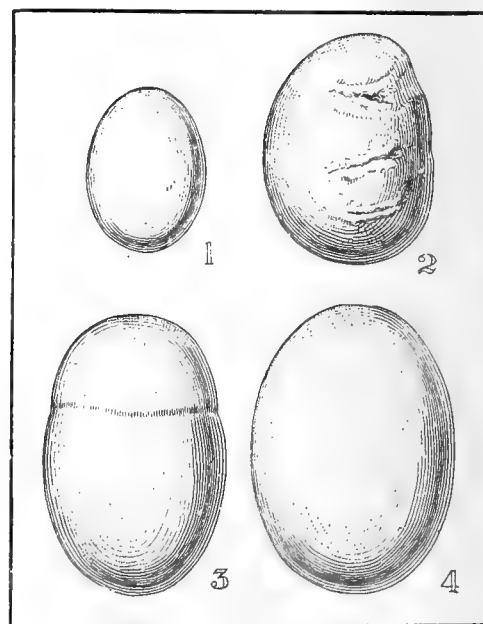
THE RESULTS OF TOO STIMULATING OR EXCESSIVE FOOD

Eggs are produced from the surplus food, which is that over and above what is required for the sustenance of the hen, and, if such is too stimulating, or given in excessive quantities, the result is that in the former case the ova are produced so rapidly that sometimes two of them drop into the oviduct together, which results in the eccentricities which frequently puzzle the poultry keeper. These ova travel together along the passage and receive the white separately, but become enveloped in one shell, and when laid are commonly known as a double-yolked egg, but more properly it is a double egg, the white be-

ing the want of shell-forming material, but rather because the shells cannot be formed as fast as the mature egg is ready for such covering.

CROOKED EGGS

Crooked eggs are no uncommon thing in the poultry yard, and are attributable as follows: Twenty-four hours are usually sufficient for the formation of a perfect shell, but when by stimulation a second ovum falls close on its predecessor, reaching it before laid, the second egg, which is up to this time soft and is lying against the hard one, becomes covered with a shell, and when laid presents a flat or crooked side the result of its position against the hard one.



3—DEFORMED EGGS

- 1—"Marble-sized" eggs containing albumen and shell, but no yolk.
- 2—Crooked egg.
- 3—Two eggs with an imperfect shell.
- 4—Double-yolked eggs.

ONE EGG WITHIN ANOTHER—"MARBLE-SIZED" EGGS

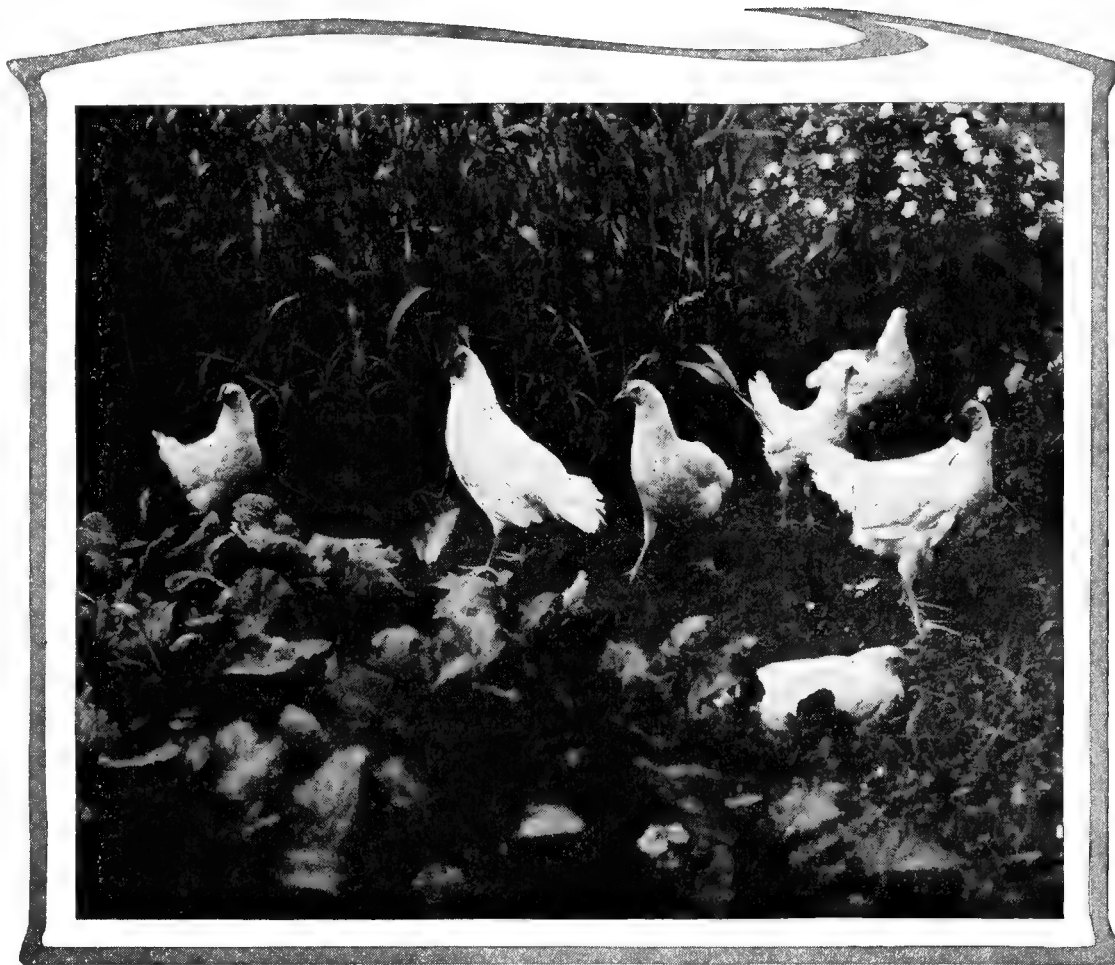
To over-feeding is also attributable the further irregularity of one perfect egg being found within another, and caused by irritation of the oviduct, which contracting in front of the per-

THE EGG AND ITS GERM

fectly-formed egg instead of behind it, forces it back until it meets another yolk, when the two join and again become coated with the white and the shell, thus producing another wonder. Other abnormalities are occasionally seen, and particularly in the smaller poultry yards. Sometimes when the ova are nearly exhausted by continuous laying, the secreting organs may be most active, which results in small marble-sized but perfect-looking eggs, which are merely a shell covering a portion of albumen. Such "eggs" when laid have the peculiarity of never having been at any stage attached to the ovary, but are a product only of the oviduct.

ROTTEN NEW-LAID EGGS

To the internal fatness of the hen are due other eccentricities than those mentioned, including the apparently paradoxical feat of laying rotten new-laid eggs, this being a not infrequent occurrence. The egg, being unable to force its way through the fatty oviduct, is retained two or three days near the mouth of this organ, and, if a fertilized one, the heat of the hen's body tends to putrify it, and when ultimately laid it is in an addled condition. To other causes, but principally diseased organs, is due a departure from the normal in the way of color. A hen which lays white or brown eggs, on rare occasions produces one almost black, while at other times these vagaries much resemble the dark green of the emu's eggs, and, in most instances, the shells are rough, wavy, corrugated, or otherwise irregular. Then there are instances of foreign matter being found in eggs,



4—HAPPY MOMENTS FOR THE LEGHORNS

clots of blood being nothing unusual. This is the result of the breaking of a blood-vessel internally, and, again, possibly the effect of over feeding.

FOWLS PRODUCING FAULTY EGGS SHOULD BE DISCARDED

Fowls from whatever cause producing any of the above misshapen or otherwise faulty eggs should at once be disposed of, for although in some cases a reduced diet may bring them back to their normal production, still the slightest cause will frequently prompt the organs to their previous irregularities, the fowls thus becoming unprofitable members of the flock. As has been seen the majority of troubles mentioned are preventable ones, and largely due to the poultry keepers' mistaken kindness in over feeding, but there are other ills of a more serious nature than those mentioned. The producing organs are of a most delicate nature, and, from the amount of work they have to do, are not only easily disarranged but are subject to a variety of diseases, the nature of many of them being unknown to the ordinary poultry keeper.



5—THE LIFE THAT GIVES VIGOR

THE BREEDING STOCK

NECESSITY OF CAREFUL SELECTION—BREEDERS SHOULD BE SOUND, VIGOROUS AND WELL MATURED—PRACTICAL POINTS ON MATING, FOOD, CARE AND MANAGEMENT OF BREEDING STOCK—HAVE FERTILE EGGS—HOW TO DETECT STERILITY

P. T. WOODS, M. D.

THERE are few poultrymen who recognize the great importance of the condition of the breeding stock from which the eggs for incubation are taken and its relation to their success or failure. The breeding stock is the foundation of the business, the life of your undertaking and the source of all the eggs which you intend shall produce chickens. Unless the breeding birds are sound, healthy and in the best possible condition for the reproduction of their kind, satisfactory results cannot be obtained. Eggs from well-fed, sound parent stock will hatch strong, sturdy chicks, even under what are considered quite unfavorable conditions. Eggs from birds out of condition, either from inbreeding, unsanitary surroundings, improper food, sickness or other causes, will never produce chicks that are worth the trouble it takes to hatch and rear them. When chicks die in the shell, are slow to hatch, or die off in large numbers within ten days after hatching, do not blame the incubator or brooder. First investigate carefully the condition of the breeding stock and the care, housing and food they receive. Nine times out of ten you will find that there is where the trouble lies. Breed for health if you wish to have and produce healthy chicks. Feed, house and care for health if you would keep your stock healthy. Remember that the eggs are the seed from which you expect to produce and grow your crop of chicks; you cannot get good wheat from poor seed. It takes generations of careful selection to produce the best. Even then poor care and careless management may spoil it all. It is just the same with chickens whether you use artificial or natural methods. To be successful you must start right; get a solid, lasting foundation.

Breed for the health of future generations by beginning now to select your breeders for soundness, vigor—in a word—Health. Keep them healthy by good food, good care and good management. Do not sow poor seed.

THE SELECTION OF THE BREEDING MALE

From the breeders standpoint the male bird is practically one-half of the breeding pen, i. e., you depend on him to fertilize the eggs laid by all the hens with which he is mated. For this reason whatever else you do, you cannot afford to be careless or indifferent in your selection of the cock or cockerel that is to head the pen. Furthermore, he must be carefully watched to see that he is capable of performing the duty to which he is assigned. Any laxness in this particular is fatal to good results.

Aside from being a typical standard specimen of the variety which he represents, he should also typify perfect health and soundness. Inferior or unhealthy male birds have no place whatever in the breeding pen. Never breed from a bird that has had or has apparently recovered from any serious sickness. In selecting a male bird for the head of a breeding pen, choose one that is well proportioned, of good size and well matured; broad, smooth backed; tail well spread at base of A (don't breed a "pinched tail"); full, deep chested; stout, strong legs and thighs set well apart, good carriage and symmetry; well-formed comb and wattles, neither too large nor too small, of a bright, healthy red; keen, sharp, bright eyes; a well-shaped,

stout beak of medium length, the whole head being perfectly proportioned to the body and carried in a manner that gives the birds an alert, active, business-like appearance. He should be in the best possible condition and capable of taking his place as head of the pen and holding it against all comers. Aggressiveness in the male bird is a desirable quality. "Hen-feathered" males with an effeminate disposition have no place in the breeding pen.

DISQUALIFICATIONS IN THE BREEDING MALE

Do not breed from any bird, no matter how perfect a standard specimen he may seem to be, if he shows the following symptoms indicating that he is physically unsound:

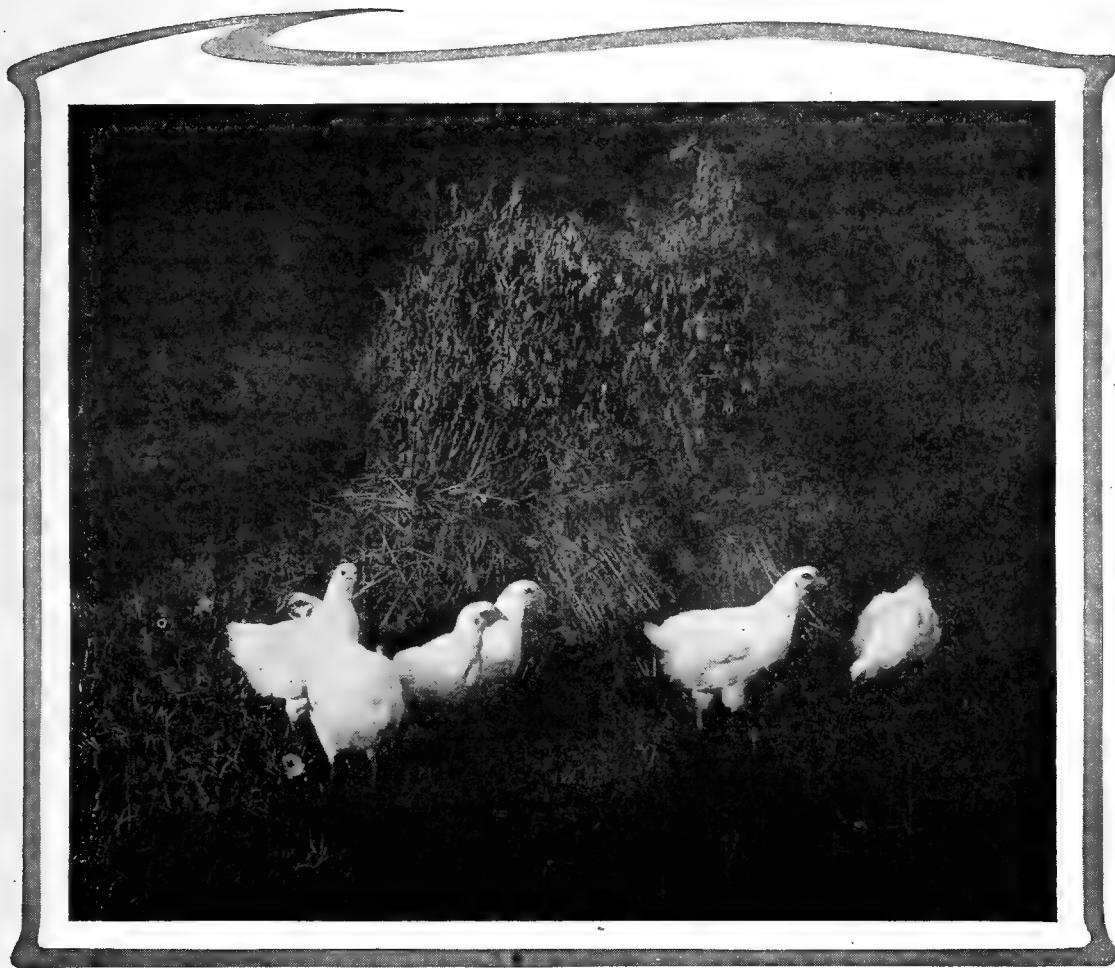
Shortness of breath on running or jumping; blueness or dark color of comb, face and wattles after chasing a hen or attempting service; pale face and comb; rattling in throat; canker of throat or mouth that does not yield promptly to treatment; putrid discharge from nostrils; foul discharge from vent; vertigo; violent shaking of the head with tendency to step backward or to one side; staggering or wobbling gait; jerking walk like "spring halt"; paralysis of any kind; emaciated, debilitated condition; leg weakness; foot, hock or wing ulcers or abscesses; deformities of any kind or any other symptom of a diseased condition. Examine the mouth and throat carefully and discard the bird if the mucous membrane appears unhealthy. Note carefully the condition of the legs. (Scaly leg can be easily cured, but it should be done before the bird is placed in the breeding pen, for the disease is contagious). If the legs feel hot and dry, look closely for other symptoms of disease. Hot feet and legs mean that something is wrong with the bird. It is a sure sign.

Breeding from an unhealthy male is sure to result in disappointment; either he will not fertilize the eggs at all or you will get weak germs. Weak germs are the cause of chicks dying at all stages of development during incubation and for several days after hatching. Also there is always the possibility and probability that chicks from such source, if they live, will inherit some tendency to disease, which will result in direct losses or indirect ones by continuance of the inheritance of an unsound constitution in the progeny, that years of careful breeding, later, will find it difficult to uproot.

CARE OF THE BREEDING MALE

When you get a sound healthy male bird try to keep him in good condition. If he is as gallant and attentive as he should be during the breeding season, he may easily get out of condition. Avoid this by removing him from the flock occasionally and feeding a few tid-bits of fresh meat (cooked or uncooked) fresh green food and a mixture of hard grains. You will run no risk by keeping him for a day or two in a comfortable coop apart from the flock where he cannot see or hear the hens, and it may save him from wasting his energies in useless services. This is important for an active, attentive male, when running with his flock, often does not eat a sufficient amount of food to keep himself in the best condition. A little attention given to supplying him with occasional meals away from his harem will be well repaid in the results gained thereby. Keeping the male bird with the hens will not insure strongly fertile eggs unless

THE EGG AND ITS GERM



6—WHITE WYANDOTTES IN A HARVEST FIELD

he is well cared for and in good breeding condition. Too many people overlook this matter or fail to consider its importance. Do not pen him up with other males—it leads to bad habits and is more injurious than continuous running with a flock of hens. Do not keep him away from the hens too long; a few days each month is sufficient, except while molting, when he will be better if kept in a coop by himself, where he can have a small outdoor run.

THE GROWING COCKEREL

Mr. A. J. Silverstein, who gave much attention to pedigree breeding and the proper conditions for growing breeders, once told the writer that he was convinced that while it is a good thing to keep the growing pullets away from the cockerels, it is not a good thing to bring up young males in the same manner. He recommended that males intended for breeders be so far as possible brought up in company with a few good, healthy hens, claiming that they thus become accustomed to the companionship of the opposite sex and better fitted for the work for which they are intended; that they were more satisfactorily attentive, less brutal, when so raised and also that they were less liable to "go to pieces" when placed in the breeding pen. There is much truth in this assertion. The writer, from actual experience extending over a number of breeding seasons, is convinced that the monastic method of bringing up a herd of cockerels together in one flock without female society is certain to result in the permanent injury to some of the most promising specimens as well as unfitting a number of others for useful work in the breeding pen. It is much better to permit them to run with the pullets and risk possible injury to the latter. The best plan is to turn a number of the most promising cockerels out on a good farm range with a flock of hens and let the best birds win.

Do not attempt raising a large number of celibate cockerels in one flock if you wish to avoid disappointment in the breed-

ing pen. It is almost certain to induce disease of the generative organs and subsequently sterility.

SELECTION OF FEMALE BREEDERS

The female breeders should be selected with as great care as the male bird. Health and sound bodily vigor should be the first consideration; size and shape the next, and then other standard requisites. Bear in mind that the size and shape of the female governs to a large extent the size and shape of the progeny. Choose well-grown well-matured, sound healthy specimens that have never been seriously sick. Prolific layers are more prone to lay infertile eggs than ordinary layers, chiefly because of the great number of eggs they produce and subsequent inattention on the part of the male. This may be overcome by giving the male a smaller flock of mates or by introducing a fresh male bird as an alternate.

An individual egg record kept with the aid of trap nests

will aid the discovery of sterile hens so that they may be removed from the flock. The leading authorities agree that there is no egg type that indicates prolificacy. The trap nest and individual egg and hatching record are the only means of determining which hens pay.

Unhealthy hens should have no place in the breeding pen. Any symptoms of disease including all those mentioned as disqualifying male breeders apply with equal force to the selection of the female breeding birds. In addition to these no female should be used that habitually lays mis-shapen or deformed eggs, or eggs containing blood clots. Hens broken down behind, or those having abdominal tumors causing the abdomen to drag on the ground should also be barred from the breeding pen.

MATING

In mating the breeding pens, avoid, as far as possible, having the same faults in both males and females, as thereby there is more liability of the tendency or predisposition to have these faults being transmitted to the progeny. As a rule the best results in hatchable eggs will be obtained by mating well-matured cockerels with yearling or two-year-old hens; or yearling or two-year-old cocks with well-grown, fully-matured pullets. Under these conditions there is no occasion to worry about pullet eggs producing weak or imperfect chicks, always provided that the parent stock is sound, vigorous and healthy. As a rule medium-sized birds for the variety make the most satisfactory breeders.

Do not (unless in exceptional cases where the specimen is sufficiently valuable to take the risk of possible failure) use breeders of either sex older than two-year-olds—that is, birds older than about thirty months at the beginning of the breeding season.

Right here it will be well to differentiate the terms applied to breeding birds, both male and female. A pullet is usually

ARTIFICIAL INCUBATING AND BROODING



7—RHODE ISLAND RED BREEDERS

spoken of as such until she has passed through one year of laying (her pullet year) or until she is about eighteen months old, when she becomes a yearling hen, which term applies until she has passed her second year as a layer and becomes a two-year-old hen. A cockerel remains such until he has passed his cockerel year or until about eighteen months old—assuming that he began developing his adult plumage by the time he was six months old. He is then considered as a yearling cock until the close of the second breeding season after he reached maturity, when he is rated as a two-year-old. These terms are used in this sense only when applied to breeding birds.

NUMBER OF FEMALES TO A MALE

The number of females which may be mated with a cock or cockerel depends largely on existing conditions. Commonly ten females is considered a sufficient number for a cock and fifteen for a cockerel. This rule has many exceptions. Some males are not fit to care for more than five or six females, while others can prove themselves capable of attending to fifty throughout a breeding season. A male that in confinement could only care for ten to fifteen will often easily serve thirty hens satisfactorily when given free range.

The number of hens a male should have also depends largely on how many are laying and how recently they began to lay.

This will be discussed further in another paragraph.

FECUNDITY VS. STERILITY

It is often stated that the prolific hen after laying a considerable number of eggs is prone to become sterile or that a large number of her eggs come infertile. Without doubt this is a fact, yet the fault does not necessarily lie with the hen.

In fact, it may easily be proved that it is no fault of the hen by giving her a new mate, when the eggs will usually again run high in fertility.

The matter is readily explained by the fact (easily observed but hitherto mentioned by but few writers; Mr. E. Cook, author of "Incubation," published in England, was among the first to mention it) that the male when introduced into a flock of hens is soon surrounded by the layers and those about to lay and that he is particularly attentive to those near laying or lately become productive, while those hens which have been laying some time or which are unproductive are more or less neglected.

Failure to serve these prolific mates sufficiently

often, and the fact that the male has his favorites among the hens, is in a large measure the cause of infertile eggs from these members of the flock. Again with the prolific layer, there being a greater number of eggs laid, it is but reasonable to expect that more eggs will escape impregnation. Where the service is frequent, eggs which escape fertilization in the first service may become fertilized by the second or any succeeding service.

This explains why it is possible for a hen to lay eggs that produce chicks having the characteristics of more than one sire, although one of the parent males has been introduced to the flock but a short time. For example, if cock 1 has served the hen at the beginning of her lay and cock 2 be then introduced for service, his seed may impregnate eggs which escaped the service of 1; so that while eggs in both the first and last litter may produce chicks from cock 1, a number of intermediate eggs may produce chicks having cock 2 for a parent.

A male bird given all the females he can attend to during his first season, will often wear himself out and become practically sterile and useless as a breeder the following year.

Mating up the pens in the fall and permitting the birds to run together throughout the year is also in many cases responsible for the low fertility of the eggs from that pen. The cock bird needs intervals of rest, but should not be kept from his mates sufficiently long to become morose and indifferent. Extremes in either respect produce unsatisfactory results. It is not reasonable to expect a male that has been running with the flock throughout a long season to possess strong fecundity unless he has received especial care and attention in both food and rest, as recommended in advice for care of male bird.

THE SERVICE

After the introduction of a male to a flock, it is possible to obtain eggs in a few days that will hatch chicks of his get, though if another male has preceded him it may be two weeks (possibly longer) before all the eggs laid can be safely credited as fertilized by the male last introduced.

How long after service impregnation takes place is not positively known, though it is probable that it may be accomplished in from sixteen to twenty-four hours, but that under some conditions a much longer time may elapse. The sperm of the male is capable of living a considerable time in the oviduct, remaining active with full power to impregnate any ripe ovum with which it comes in contact. It has been established by many experiments that one service will suffice for the majority of eggs laid from the second day to two weeks immediately thereafter.

Some observers claim that one service is sufficient for one



8—PLENTY OF SHADE IS ESSENTIAL FOR SUCCESS

THE EGG AND ITS GERM

month, providing the hen was just starting a litter at the time of service.

From this it follows that it is not necessary to waste the strength of the male bird in useless service. Where the poultryman possesses an especially fine male from which he desires to obtain the greatest possible number of chicks, the bird could be made to care for a considerable flock of females by mating him only with the layers or those about to lay; or by dividing the layers into several flocks and permitting the male to run for a few days twice a month with each flock, giving him brief intervals of rest between. In fact, it is possible and quite practicable as well to keep an exceptionally fine male "standing at stud" as is common in breeding other domestic animals, and to bring the females to him for service at regular intervals once every week or two weeks; always endeavoring to have the hen served when about to begin her lay.

TESTS OF STERILITY

There is only one way to test the fecundity of the male bird and that is by mating him to several females and then

hatches are seldom as satisfactory since the germs are more liable to be weak.

Semi-confinement in large runs and roomy houses will give good results if the fowls are well cared for. The quarters should be kept in good sanitary condition and the ground of the runs kept sweet by plowing and planting at regular intervals not too far apart.

Close confinement in cramped quarters and small runs is fatal to successful breeding. Exercise is essential to health and the breeding stock must be kept busy if fertile eggs and strong germs are wanted.

SUGGESTIONS AS TO HOUSING

Breeding birds should be comfortably housed, but this does not mean that they need to be pampered or to have specially constructed poultry houses or buildings supplied with artificial heat. The men who are getting the best results in producing eggs that hatch well in the winter season house their birds in what are commonly spoken of as cold houses. These are tight, well-made buildings either provided with



9—WHITE WYANDOTTE PULLETS RESTING ON A HOT SUMMER DAY

incubating their eggs. If the eggs do not show a good percentage strongly fertile, the male is useless as a breeder.

Sterile females can be located by means of trap nests and individual egg records. If after incubating a number of eggs from any hen a large percentage show infertile, try her with another male and test the eggs again. If she still fails to produce fertile eggs in sufficient numbers to make her worth using, discard her.

Hens with very long, downy fluff feathers (particularly Cochins and Brahmas) will sometimes appear to be sterile, but if the fluff is plucked or clipped so as not to interfere with service, they usually prove to be all right and produce their share of fertile eggs.

FREE RANGE VS. CONFINEMENT

Birds on free range, if otherwise well cared for, will produce a greater percentage of strongly fertile eggs than those kept in confinement, other things being equal. The confined birds may produce a considerable number of fertile eggs, but the

scratching sheds where the fowls can have a sheltered place to exercise and are at the same time supplied with an abundance of fresh air, or closed houses having windows or doors in the front which are opened wide daily to admit a large volume of fresh air and practically convert the house into an open shed. In such buildings the birds keep in better health and are less liable to colds than when confined in warm houses and houses supplied with artificial heat.

In the matter of housing the safest plan is to provide comfortable, tight buildings, so arranged that they can be thoroughly aired and sunned daily while the birds are exercising. Keep these buildings practically wide open throughout the day except on very stormy days. In most localities there will be very few days in winter when the house cannot be kept open for a few hours during some portion of the day. Such houses should always be closed at least an hour or two before dark and remain tightly closed all night. Keep the houses clean and in a sanitary condition. Filth and success are sworn enemies

ARTIFICIAL INCUBATING AND BROODING



10—GETTING THE RIGHT START

and are never found on the same poultry plant. Care should be taken not to overcrowd the poultry buildings and there should not be more fowls in the pen than can find comfortable roosting accommodation. As a rule it is a good plan to allow about 10 square feet of floor space per breeding bird and not to run more than 15 or 20 birds in a pen, according to the variety.

Bear in mind that exercise is of vital importance in keeping the breeding birds in good condition and for this reason they should receive a large proportion of their dry grain food fed in deep litter. It is the active, busy, hustling hen who is always scratching in litter and may be found at almost any time buried tail deep, with straw flying in all directions, that produces the eggs that hatch best. Any good litter material may be used, either straw, chaff, corn-stover or planer shavings, and this should cover the floor of the breeding pens from 6 to 10 inches deep. Leaves may be used, but they do not make as satisfactory litter material as either straw or shavings.

After the snow comes, breeding stock should always be kept confined to poultry houses until the weather becomes settled in the spring. Dry earth floors, well littered, are very satisfactory, but if there is any tendency of the earth floor to be damp or wet, a wooden floor is more desirable. Do not allow breeding birds to run on the snow and ice or to eat frozen grass or weeds.

FOODS AND FEEDING

Given sound, healthy breeding stock, well housed, the food and the manner of feeding it plays a most important part in the getting of fertile, hatchable eggs. It is not necessary for the breeder to trouble himself with regard to the chemical composition of the grains or the nutritive ratio of the food fed so long as he supplies his birds with an abundance of good, wholesome food in variety. It is much better to allow the birds a reasonable opportunity to balance their own ration than for a breeder to attempt to prepare a scientifically balanced food, the formula for which is based largely on guess work, haphazard reading and theory. The average healthy fowl

instinctively knows what it wants and what its system craves and can be trusted to balance its own food ration if given an opportunity. This should not be construed to mean that the poultryman should entirely ignore the chemical content of the foods he supplies his flocks. The government chemists supply us with ample and authoritative information as to the constituents of all the foods available for poultry feeding.

We know that the grains like wheat, barley, corn and oats are well proportioned in regard to protein, carbohydrates, fats and mineral matter. We also know that clover and alfalfa are rich in protein and mineral matters, possess health giving properties and supply the necessary bulky food without which the digestive organs

of the fowl will not work properly. We also know that in beef scraps and other meat food we have a product rich in animal protein, differing in some not thoroughly understood way from vegetable protein, and very essential to the life and health of the fowl. If we know this we have little need to worry ourselves concerning the chemistry of foods, provided we give the birds an opportunity to select what they need as they require it.

Wheat, barley and corn are named because they are the most desirable and most easily obtainable grains, as well as the most economical. Oats, if of good quality, may be substituted where barley cannot be obtained, but are not nearly as satisfactory. Barley and corn can be made to answer if wheat is scarce and high. Heavy wheat bran is desirable for use in dry or moist mash. The coarse light bran contains more fibre and is of less value. Clover or alfalfa is necessary to afford roughage and supply a substitute for the anti-scor-



11—BLACK LANGSHAN CHICKS

THE EGG AND ITS GERM

butic and medicinal properties of fresh plant life. Breeders who use clover or alfalfa freely and encourage their fowls to eat it, get the best results in fertile eggs.

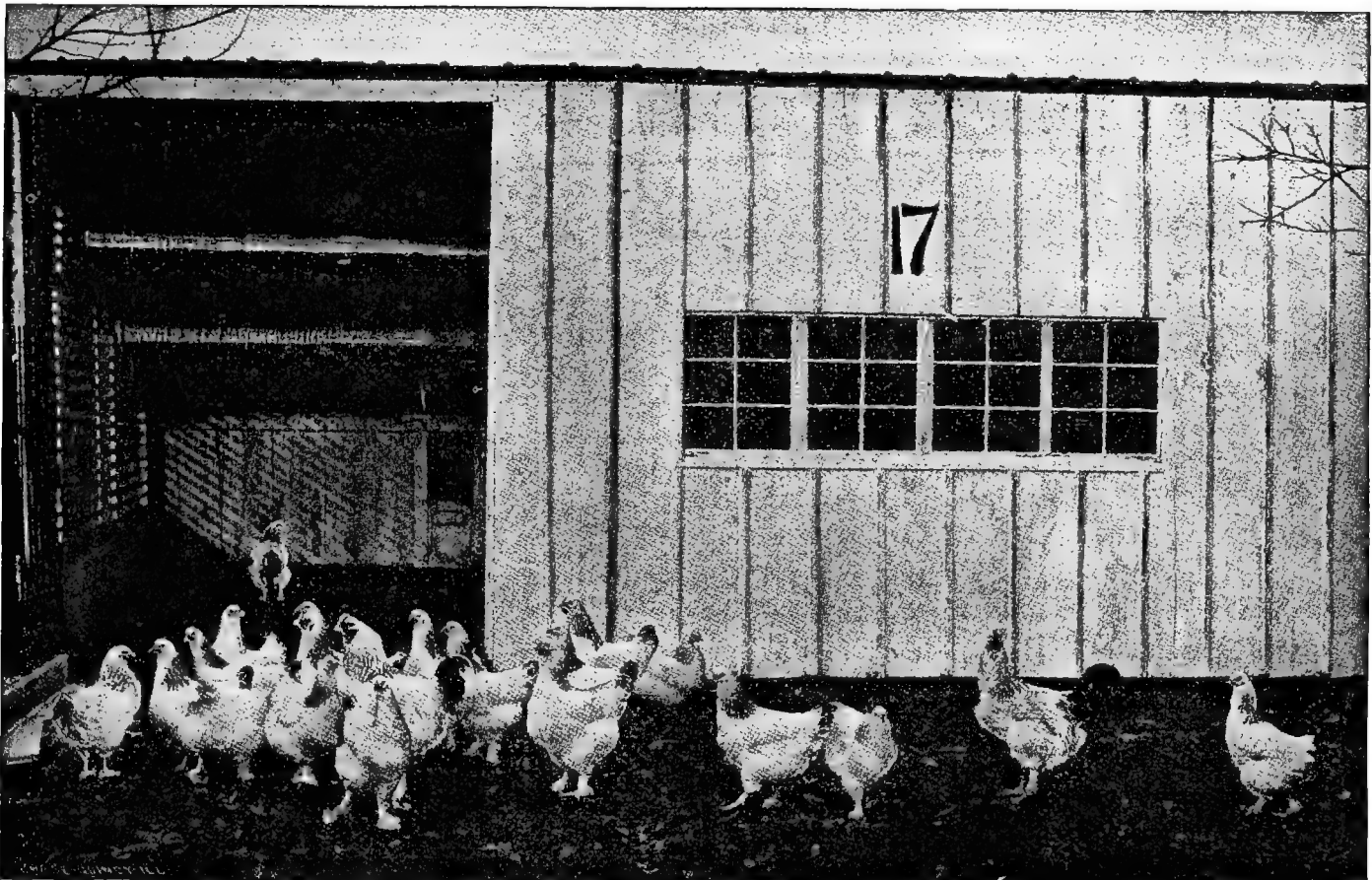
It is not possible to get strong, well fertilized, hatchable eggs where birds are forced for egg production by feeding concentrated mash foods. Mash food fed too freely or too often will result in large watery eggs that will not hatch well. The free use of moist mashes also tends to create more or less disturbance of the digestive organs, resulting in looseness of the bowels or some other evidence of lack of perfect condition. This does not mean that mashes should not be fed to breeding birds, but that rich mash food should never be pushed with a view to getting the greatest possible egg production if the eggs are intended for hatching purposes.

Highly concentrated mashes, containing quantities of beef scrap or other meat food, should not be fed to breeding stock. Any considerable amount of scrap or other meat food fed in the grain mixture has a tendency to create digestive distur-

always a morning mash. Whatever time you select for feeding mash, be sure to have it come at the same feeding time each day. No matter what else you may neglect, do not fail to see that your birds have regular meals or, if you dry feed, that they are always supplied. Careless, or irregular feeding methods are sure to upset the condition of the stock.

If the birds do not take kindly to the clover in the mash at first use only a very small quantity and gradually work it up as the fowls become accustomed to it. The other feeding should be a mixture of hard dry grains fed in the litter.

A good scratching grain mixture can be made of 30 pounds each of wheat and barley to 40 pounds of freshly cracked or whole corn. Keep grit, oyster shell and dry, pure beef scrap constantly before the birds in a grit box or food hopper. In addition to this, whenever obtainable, hang cabbage in the pen for the birds to work at, or split beets or mangel wurzels in halves and nail them, cut surface outward to the studding of the



12--WELL VENTILATED HOUSES ARE INDISPENSIBLE

bances and it is the belief of the writer that nearly all of the trouble which has been experienced by those who feed mash foods is due to the use of meat and animal fats in the ground grain, moist mash mixture.

A MOIST MASH RATION FOR BREEDING STOCK

Where it is desired to feed breeding stock according to the moist mash method, the following will be found a desirable plan for feeding: Scald a quantity of cut or mealed clover or alfalfa, sufficient to form one fourth to one-half of the bulk of the mash for your flock. Into this stir a mixture of equal parts by measure of heavy bran and coarse corn meal or equal parts by measure of corn and oat chop and heavy bran. Mix the whole into a crumbly mash as dry as possible and feed either morning, noon or night, according to the convenience of the breeder. When fed at night this mash should be followed by a feed of mixed hard grain. Adopt some regular plan of feeding and stick to it. If you start with a morning mash, make it

poultry house, at a convenient height for the birds to pick at.

A GOOD DRY FOOD RATION FOR BREEDING STOCK

In the litter use dry grain scratching food consisting of the same dry grain mixture mentioned above, or made of 30 pounds coarse cracked or whole corn; 30 pounds wheat; 30 pounds barley; 7 pounds kaffir corn, and 3 pounds sunflower seed. This should be scattered morning and night in deep litter always keeping a sufficient amount of grain in the litter so that the birds can find a kernel by scratching for it. Keep dry, pure beef scrap constantly before the birds in one compartment of the food hopper; keep the other compartment of the food hopper filled with a dry grain mash mixture made as follows: 40 pounds of corn; 20 pounds of barley and 20 pounds of wheat ground together to a medium coarse meal, add to this 20 pounds of heavy bran and mix thoroughly, dry. This should be fed dry from the food hopper, never moistened, and should be always kept before the birds.

HATCHABLE EGGS

GETTING FERTILE EGGS—MERITS OF GREEN FOOD—SELECT THE EGGS—DEFINITE RESULTS FOLLOW DEFINITE CONDITIONS—THE VALUE OF MEAT AND CUT BONE

A. F. HUNTER



AS THE hatching season approaches we shall do well to consider how to get eggs that will produce strong, vigorous chicks. It is of little advantage to hatch weak, puny chicks. They linger along a week or two, then pine and die; there is no satisfaction in hatching such chicks, and yet, unfortunately, a great many such are hatched. If the knowledge requisite to the

hatching of strong, vigorous chicks was more generally taught, and lived up to, the present chick mortality would be decidedly lessened, and our profits very much increased.

We use the above title, "hatchable eggs," and use it advisedly, because thousands and thousands of eggs are put into incubators or under hens which never ought to be used at all; they will not hatch if incubated, or, if they do hatch, the chicks produced will be too weak and puny to live long. The witty "Autocrat of the Breakfast Table" was asked when the education of a child should begin, and replied, "twenty years before the child is born," and we ought to begin to work for the good, hatchable eggs at least a year before the eggs are produced. This, of course, means selecting the birds for our future breeding stock while they are still chicks; their strong, sturdy appearance at that time plainly indicates strength and vigor of constitution which will make them hardy and vigorous birds.

An excellent illustration of the great benefits of strength and vigor in the breeding stock is seen in a letter from a Tennessee poultryman from which we quote: "I give my incubator good attention and use only the best eggs, carefully tested for good, even shells, and I always set two hens at the same time. When I test out the infertile eggs I replace with live eggs from under the hens, so that all the eggs left in the machine are strongly fertile, and it is no wonder to me that I hatch nearly all of them. From time to time I compare it precisely, so that when hatching time comes the chicks hatch like popping corn. When I take off a hatch I do not expect a single chick to die, and they rarely ever do. If this sounds to you like bragging let it go at that, but the statement is true, that from the last three hatches I have made not a single chick has died. They have been raised in brooders, in the dead of winter as well as at other seasons of the year

"The suggestion that you make, that I have to incubate 5,000 eggs a month to market 2,000 broilers a month seems to me, in the light of my own experience, simply preposterous. You may be right, but give me such hens as I have, let me select the eggs, run the incubators and superintend the feeding and care of the chicks, and I would not give any one ten cents to guarantee me 4,000 broiler chicks from 5,000 eggs. I know I should do better than that here in Tennessee. If this sounds like foolishness to you, it must be because you have operated in the north and raised your chicks in confinement. Mine have large runs on blue grass and white clover from the time they are two weeks old, the year around, and they inherit good constitutions from parents raised in like manner, and they just simply don't die."

There is a moral in that story. What a splendid example of strength and vigor in the breeding stock, grown from chicks that inherited strength and vigor from their parents. Note, too, that the eggs are "only the best eggs, carefully tested for good, even shells." Far too many of us do not "select" the

eggs from which the chicks are hatched, to say nothing of "selecting" the hens that are to lay the eggs! If however, we are to have generations of strong-constituted stock we must work for it as does our Tennessee friend; we must build up the strength and vigor by careful and persistent "selection" for these much desired qualities.

SELECTING THE BREEDERS

In the winter is a good time to study the birds from which we wish to select our next season's breeders, picking out those that are most active and vigorous, and that went to laying promptly after getting through the molt. The eggs of hens are of larger average size and the chicks hatched from hens' eggs are (as a rule) larger, stronger and more vigorous, and mature into larger and better birds. Select breeders for their strength and vigor and from birds that did the best laying in their pullet year, then we will have accomplished the one step in the general upbuilding of the strength and vigor of the whole flock.

Practical poultrymen of large experience agree that the prime causes of lack of vigor in the chicks are inbreeding; breeding from weak and debilitated stock and breeding from immature stock. It is easy to avoid all three of these causes of lack of vigor in the chicks, and if we give our attention early to selecting the birds from which we are to raise the following season's chicks we shall start in with a great advantage.

RAISING THE BREEDING STOCK

Our future breeding birds should be brought up on free range, where they can get plenty of fresh air and exercise and have plenty of shade when they want it, and should be fed a ration which will produce flesh rather than fat so that they grow strong, muscular, hardy, and have much reserve strength. This stock after being brought into the houses for the winter should have plenty of fresh air and abundant exercise. To attain these things the curtained front scratching shed house is desirable and they should be compelled to work and scratch for every kernel of grain they eat. Scratching and searching quickens the circulation and promotes digestion; in other words, it promotes and preserves good health; and such birds, fed a well-balanced ration, and breathing sweet, pure, fresh air, will produce good, sound eggs, eggs with firm yolks and whites of the right constituency and with sound, strong shells, and when put in an incubator or under hens, with the hatching conditions right the chicks will come out "like popping corn."

Green food in winter is most essential. When running at large in the fields growing pullets eat a very great quantity of grass-blades, etc., and when they are brought into the pens of the poultry houses they must have green food regularly supplied to them, if good health is to be maintained. What this green food is depends upon what supplies we have; it may be any one of several things or it may be of several kinds. Cut clover or alfalfa in the mash are the best articles for this green food supply, and fresh cabbages are a close second. Almost any kind of vegetables or fruits such as turnips, beets, carrots, apples, etc., are good, and the birds eat them greedily. Not only do these green foods promote the general health of the fowls, but they are economical to feed because they "extend" the ration and thus save the consumption of grain and more costly foods.

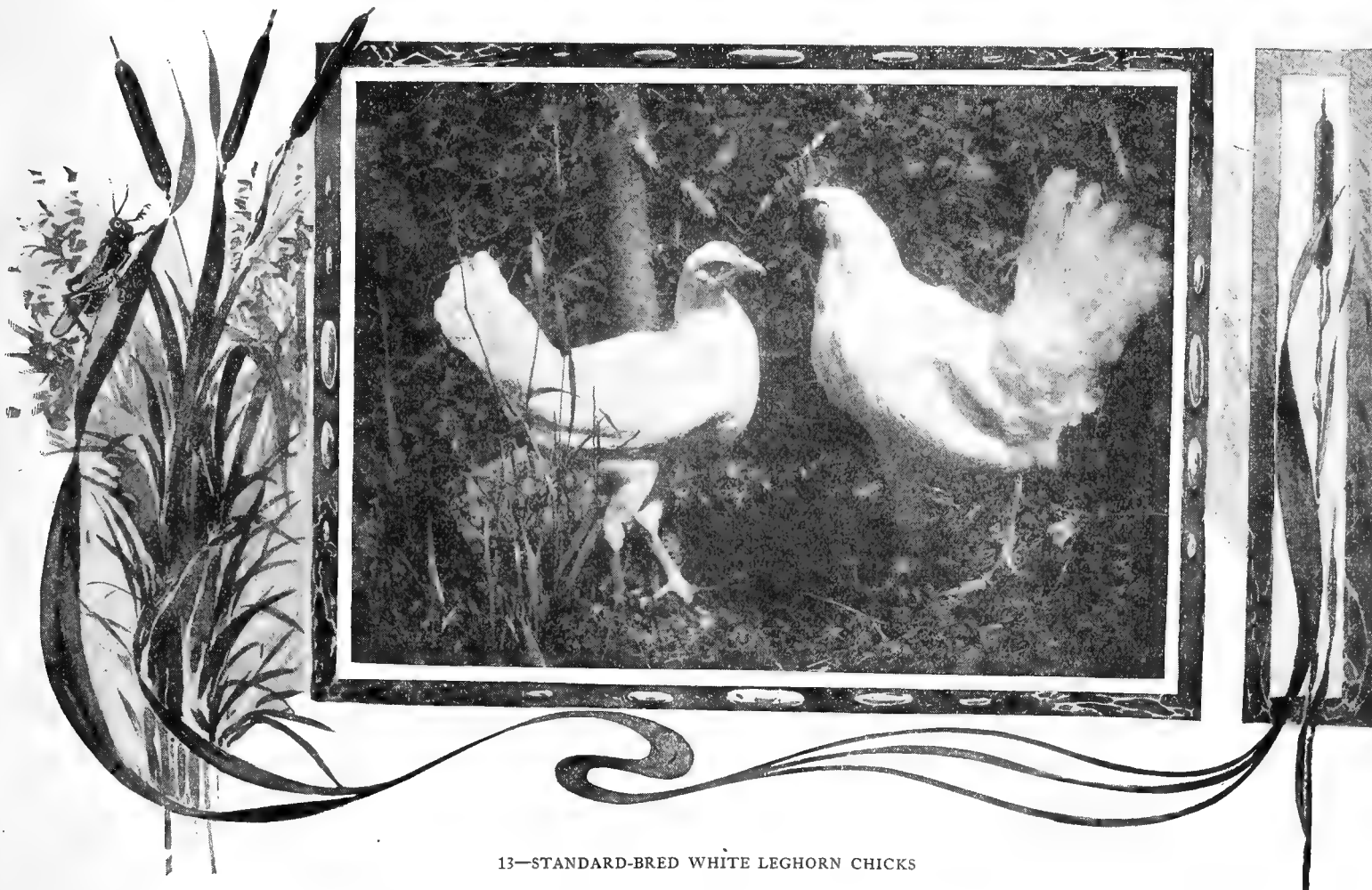
THE EGG AND ITS GERM

SELECTING THE EGGS

Not only should we select the breeding stock, but we should "select" the eggs laid by the breeding stock. Do not set an egg, even from your best hen, if it is a poor egg; by which we mean poorly-shelled, poorly shaped, or otherwise lacking in the qualities which make up a good egg. The fancy poultry breeder gives too little heed to the most important points of strength and vigor of the chicks, and will use misshapen and poorly shelled eggs if the hen that laid them is all right—is possibly a first prize winner. He is thinking of the fine points of the hen and not at all of whether the chicks hatched from those eggs will grow up strong, sturdy and vigorous. The practical poultryman, on the contrary, can ignore the show qualities, and should consider only the strength and vigor of the offspring. Therefore, after we have selected our best breeding birds, paying particular attention to the points requisite for constitutional health

full strength and vigor. Such will produce good chicks if the females are right.

It is sometimes advisable, too, to alternate males in the pens. One breeder got 79 per cent hatch from all eggs put in his incubators, and one of the methods he employed was to have six breeding males for four breeding pens, and keep the males moving from pen to pen, each male having one day in each pen and two of the males being out resting all the time. There are many advantages in such a plan as it prevents the male having special favorites among his mates and ignoring others. Of course this plan interferes with what is called "special matings," but for the practical poultry raiser special matings are unnecessary. The points for him to consider are strength and vigor of the chicks, and to that end he should study the strength and vigor of the breeding stock and the conditions which promote the good health of that stock, and then aim to produce "good hatchable eggs".



13—STANDARD-BRED WHITE LEGHORN CHICKS

and vigor, we should reject every egg that is questionable, and put in the incubator or under the hens only such as give the best promise of producing first quality chicks.

Undoubtedly the eggs from the year-old hens will produce the largest, strongest and most robust chicks, hence, if we are aiming at the very best results we will not breed from pullets, even though they be a full year old at the breeding season; it is much better that they pass through the summer and through one molt so that their "staying power" becomes manifest. Not infrequently a pullet which is very promising at six or eight months old and proves a most excellent layer for a time, develops some constitutional weakness, or some defect develops.

Such illness is good and sufficient evidence of lack of vigor, and the manifestation of any lack of vigor should exclude the bird from the breeding pen. Be sure that the cockerels put in the pens are early hatched and fully matured, with stout, sturdy legs and broad backs; in fact, that give abundant evidence of

FEEDING FRESH CUT BONE

It has come to be generally understood by poultrymen that feeding meat and bone in some form is necessary if we would have the chicks thrive and the pullets and hens lay eggs. Animal food supplies the food elements which promote growth and induce egg production; indeed, the egg shows by analysis chemical constituents very similar to those of lean beef, hence beef, if we could economically feed it, would give the fowls the best food elements for egg production. The analysis of the two is substantially as follows:

	Fresh Beef	Eggs
Water.....	64	74.5
Protein.....	14	12.5
Fat.....	21	12
Salts.....	1	1

It is impossible to profitably use fresh beef as a food for fowls and chicks, but in the waste pieces produced in preparing

ARTIFICIAL INCUBATING AND BROODING

animals for human food there are several products which furnish the desired food materials for this purpose. Fresh bone, cut into pieces sufficiently small is one of the very best of animal foods. Speaking upon this point a bulletin of the United States Department of Agriculture says: "Where fowls are kept in confinement it will be necessary to supply some meat food. Finely cut fresh bone from the meat markets is one of the best if not the best kind of meat food for laying hens and young chickens." The bone should be fresh, and should be freshly cut, and this point is especially mentioned in the above bulletin, which says: "Tainted bones should be rejected as unfit for food."

In cut fresh bone from the meat market we have one of

the best, if not the very best, of animal foods, and one so moderate in cost that every keeper of fowls who has facilities for procuring the bone cannot afford not to feed it. The manufacturers of bone cutters have carefully studied the conditions of bone-cutting, and have given us, in the modern bone cutter, a machine which is especially adapted to the turning of this waste product into an excellent food for fowls and chicks. Fresh bones have to be cut. They cannot be ground unless first cooked and then dried, which almost wholly extracts the animal matter and leaves practically only mineral matter, chiefly lime. A good bone cutter will cut the fresh, raw bones, with the attached pieces of meat, gristle, etc., and make them into a food, which promotes growth in chicks and increases egg production.

WEAK GERMS IN WINTER EGGS

TESTS CONDUCTED WITH EGGS LAID PREVIOUS TO AND DURING WINTER CONFINEMENT—WARM HOUSING LOWERS VITALITY—EVIL EFFECTS OF STIMULATING FOOD—COLD HOUSING GIVES BEST RESULTS—GENEROUS RATIONS DID NOT LESSEN FERTILITY

A. G. GILBERT



DURING the months of March and April for some years past investigation has been made at the Canadian Experiment Station with the view of discovering, if possible, the cause, or causes, of so many weak germs found in eggs laid at the latter part of the winter and in early spring by hens which were confined to limited quarters in the farm poultry houses. The houses were artificially heated to a moderate temperature, varying from 30 in cold weather to 50 degrees on mild days. The fowls had been gently stimulated to lay, but with no condiment, and had laid fairly well. But these eggs when hatched out in late March or April by incubator or hens, produced few chickens. The eggs on being tested showed a fairly satisfactory percentage of fertility, but on examination, after the hatch was over, a great many chickens were found dead in the shell, the majority of them, at the "pipping" stage.

TESTING STRENGTH OF GERM IN EGGS LAID IN DECEMBER

With the view of obtaining further data a number of pens were mated up on the fowls going into winter quarters. Tests heretofore had been made towards the end of the winter season. The object of this occasion was to test the fertility and strength of germs of eggs laid in December and before the hens had become enervated by long laying or confinement. Accordingly on December 20, 181 eggs of different breeds (enumerated further on) were placed in an incubator. On the 26th instant 18 clear eggs (i. e., without germs) and 6 with partially developed germs, were removed.

On January 1 (eleven days from date of placing eggs in incubator) a further test was made with following results:

Barred Rocks—46 eggs showed 69 per cent fertility

Light Brahma-Barred Rock Cross—54 eggs showed 90 per cent fertility.

Rhode Island Reds and White Plymouth Rocks—49 eggs showed 61 per cent fertility.

Buff Leghorns—8 eggs showed 26 per cent fertility.

The rapidly developing germs presented a strong and healthy appearance. This was confirmed by later examination. An unfortunate accident to the incubator two days before the chickens were due resulted in the death of all but 26, which, however, hatched out apparently strong and healthy.

TESTS CONDUCTED DURING THE WINTER

Further experimental tests were made with eggs laid from time to time during the balance of the season and confirmed

the conclusions of previous years. These conclusions showed that the longer and closer the term of artificial life of the laying stock the greater was the weakness of the germs. Experience has shown, with no uncertainty, that it is one thing to have a high percentage of fertility and another to have results in a corresponding number of robust chickens. It is the strong and lively chicken which will make rapid growth, that is wanted. It has been shown by experiment that the germs in eggs from hens closely confined to winter quarters, but laid in spring time, although showing a high percentage of fertility, did not result in many chickens. The germs had died in different stages of development, the greatest number when fully developed, or at the "pipping stage." And in many cases the chickens which came out proved weaklings. As warranting the foregoing conclusions, the following results of experimental tests are given:

HATCHING RESULTS IN AN INCUBATOR OF EGGS LAID BY HENS IN MODERATELY HEATED HOUSES

On March 27, 202 eggs of different breeds were placed in one of the most reliable incubators on the market. The result was 39 chicks. The eggs placed in the incubator were laid probably during the third week of the month named, and by hens which were kept in artificially but moderately heated compartments of our poultry houses. The fowls had received generous rations with a view to egg production, and had laid fairly well for the most part of the previous winter.

The examination of the unhatched eggs showed that the great majority contained chicks fully developed but dead, presumably too weak to break their way out of the shell, a very discouraging result certainly. Under similar circumstances the first conclusion would be, on the part of the inexperienced, to blame the incubator. But if it hatched 39 chickens, was it not as capable of hatching out more, if germs were as strong in the unhatched eggs as in those which produced chicks?

SIMILAR EGGS UNDER HENS AND RESULTS

In order to ascertain results with hens as hatching mediums, on the same day as the incubator was started, four Faverolle hens, which were broody, were given 13 eggs each. The eggs were of the same kind and age as those put into the incubator.

Of the 52 eggs set, 17 hatched, so that as compared with results from the incubator this showing is in favor of the hens, but the average experience of several years past does not point to much difference between incubator or hen when conditions are equally favorable to both.

THE EGG AND ITS GERM

RESULTS FROM EGGS LAID BY HENS IN COLD HOUSES

The above results, it will be borne in mind, are from eggs laid by hens which had been kept in warm houses and given rations calculated to gently stimulate egg production during winter. It will be interesting, then, to compare these results with those from hens which had not—nor had their parent stock—known what warm winter quarters were, fowls which were kept under such conditions as are to be met with in the majority of farm yards throughout the country.

On the 11th of March 13 eggs laid by Buff Orpington pullets from hardy stock—as described above—were set under a B. P. Rock hen. On the 2d of April 10 chickens hatched. On eggs being tested, one clear egg was found. Examination of the two eggs which did not hatch showed two embryos, which had probably died about the fourteenth day after the eggs were put under the hen.

On March 21 (ten days later), 13 eggs, also laid by Buff Orpington pullets, were placed under another B. P. Rock hen.

To farmers, particularly those living in America where the winters are rigorous, these results are important, as they are strikingly in favor of fresh air and plenty of it, even if it is cold.

They are doubly important, as giving proof that with intelligent effort it is possible and profitable to build up strains of fowls to suit winter conditions, rather than to attempt making winter conditions suit the fowls.

VALUABLE CONCLUSIONS DRAWN AS THE RESULTS OF WINTER TESTS

A summary of the experiences gained in connection with the testing and hatching results of eggs laid during the cold season under conditions described may be given as follows:

1. The generous and gently stimulating rations given to the fowls kept in cold houses did not seem to affect the strength of the germs of the eggs laid by them, as similar rations apparently did in the case of the hens kept in artificially warmed quarters.



14—COLONY HOUSES ON GRASS RANGE

On the 11th of April, 11 chickens hatched; one chick was crushed in the nest by the hen. Examination of the remaining egg showed a fully developed chick dead about "pipping" time.

On March 21 (same day), 13 eggs of Buff Orpington pullets were given to a Langshan hen. Result, 11 chicks.

The most convincing results were obtained from 16 eggs (half Buff Orpington and half B. P. Rock pullets), which on March 9 were placed under a large hen, and in due course every egg hatched. And what was further satisfactory, every one of the 16 chickens lived and made rapid growth.

The total of 48 chickens from 55 eggs laid by pullets, which had been kept in cold winter quarters—as had their parent stock—and which had been good winter layers, is in favorable contrast with 17 chickens from 52 eggs laid by fowls which had been kept in artificially warmed poultry houses.

It is also an effectual answer to the statement, sometimes made, that strong germs cannot be had in early spring time from hens which have laid steadily during the winter.

2. Eggs laid in early December by the hens in artificially warmed houses showed a greater percentage of strong germs than did eggs laid by them later in the season.

3. Eggs laid by the same hens in early spring showed a satisfactory percentage of fertility, but the weakest germs.

4. The most striking and gratifying results were obtained from the fowls which, like their parent stock, had never known warm quarters. From 55 eggs laid by these fowls in early spring—after laying well during the winter—48 strong chickens were hatched. In contrast with this are 17 chickens from 52 eggs laid by hens kept in warmed, but comparatively limited quarters.

5. Results were strongly in favor of the average farm conditions. One successful farmer has an open shed attached to his poultry house, and to this shed, which is protected by a curtain in stormy weather, his fowls have access, so obtaining fresh air and exercise. The latter is secured by throwing grain in litter which is always on the floor of the shed.

ARTIFICIAL INCUBATING AND BROODING

FERTILITY IN EGGS

GREEN FOOD NECESSARY TO FERTILITY—
VIGOR AND GROWTH OF CHICKS DEPEND
UPON VIGOR AND HEALTH OF PARENTS

C. A. HULBERT

IN ORDER to understand the requirements of artificial incubation we shall need to first consider the observed facts in relation to the natural process. A late spring obstructs the fertility of the eggs for early hatching unless a store of vegetable food was put away for winter use.

Hens that are steady layers are very liable to disappoint the owner in the matter of fertile eggs in the spring. It will be found that not one egg in a dozen will hatch. Later, after the same hens have been given a daily run, and have picked the fresh grass, no fault will be found on the ground of fertility. Hens need green food in the spring more than any other creature on the farm. During the season for selling eggs for hatching we hear more or less complaint about rotten eggs. Beginners are apt to believe that a rotten egg is an infertile egg and that it must have been old before shipping. On the other hand, a rotten egg is good proof that it was fertile, but the germ not being strong, it soon died after the heat of the hen or the incubator started to develop it. The truth is that eggs do not become rotten when there is no male bird with the layers. They merely dry up. An egg not impregnated will come out from under a hen at the end of three weeks' incubation perfectly clear, while one that is impregnated if sat on forty eight hours and then taken out will at the end of three weeks be of bad odor.

When an egg that has never been in an incubator is broken the albumen adheres closely together and does not run over so large a surface. An infertile egg placed under the heat of 103 degrees for one week will in appearance and taste be equal to a fertile one that has been laid away for two weeks.

Just why some chicks outgrow some others when the conditions are apparently the same is a question that is hard to answer. There are, however, several reasons which may be assigned as a cause for this lack of growth in the early days of a chick, the main one being lack of vitality and vigorous constitution of the parent bird.

It may appear to some that if these conditions exist at one stage of the hatching season they would also prevail at others, but that is not necessarily the case. Much of the vigorous growth of a chick or the reverse depends upon the condition of the parent fowl at the time the egg was laid, which is the beginning of the chick's growth. In view of this fact attention must be paid to the healthfulness and vigor of the flock from which the eggs are gathered for incubating purposes.

Then again much depends upon the condition under which

the eggs are incubated. Good sound eggs laid by vigorous stock should when properly incubated bring forth chicks that with correct handling should grow right from the start; but the treatment, feeding and conditions surrounding the chick during its early life have a great deal to do with its rapid and vigorous growth.

We must observe all these facts; employ every agency at our command; see that right conditions exist; use nothing but strong, well developed parents, and if proper care is given the youngsters we will reap the reward of our labor in dollars and cents.



15—AN INTERESTING FAMILY

The photograph from which the above half-tone was made was taken in Australia.

CONDITIONING BREEDING STOCK

SELECT BREEDERS WITH REGARD TO VIGOR—
SUPPLY FOOD AND CONDITIONS RE-
QUISITE TO SUCCESS—WINTER FEEDING

H. A. NOURSE

THE problem of conditioning breeding birds is by no means a difficult or intricate one. Any poultryman worthy the name selects each season birds of the development and style that denote vigor and constitution, while selecting the shape required for the variety in hand. It is a fact that birds of standard size and shape are not produced year after year by any but healthy, vigorous stock and the breeder cannot avoid protecting the constitution of his strain when following the course necessary to produce good representatives of his variety. Constitutional vigor is the source of strong procreative power and is built up only by careful breeding for a term of years.

With this characteristic well established it remains only to maintain good health and normal condition of flesh to produce

THE EGG AND ITS GERM

eggs which will bring forth chicks that will live, thrive and make a profit. In this connection it is safe to remember that appearance, although a good indicator of health, is by no means infallible and a bird may be in the best condition, apparently, yet unable to produce a fertile egg. Supply the food and conditions required and trust to nothing less, whatever the appearances, to bring about the desired results.

Every effort should be made to conserve the energy and maintain the strength during the winter when conditions are largely artificial. This does not mean that all profit from the birds in a practical way must be lost or that a hen may not lay well during the winter and produce strong, fertile eggs in the spring. It is only necessary to build up day by day the vitality which egg production tears down, that the hen shall not be the loser. The best rule to follow during the winter is this: provide as well as possible the exercise, fresh air and foods that the hen would get if allowed her freedom on a grass range in summer.

Of these, exercise is the most difficult to obtain. The dry grain may be fed in the scratching material and the methods of dry feeding now becoming popular enable the feeder to get the most exercise for the grain fed. As the hen cannot range wide, she must dig deep and the scratching material upon the floors therefore should be deep and frequently renewed to keep it light and clean.

Fresh air is easy to obtain and costs nothing; yet it is rigidly excluded from some poultry houses where the moisture from the birds' breath, condensing upon the cold walls of the building, keeps the interior damp and the fowls unhealthy and the caretaker condemns the house as unfit, and the birds as delicate. But let the windows on the south side be opened wide whenever the temperature outside is not below twenty-five degrees above zero, Fahr., or open less in proportion as the cold increases and the moisture will disappear as fast as it collects, leaving the house dry and comfortable.

In severely cold weather or when winds drive snow or rain into the house, light frames filled with cotton cloth may be fitted into the space made by dropping or raising a window a few

inches, admitting plenty of fresh air, but preventing a draft. The use of these frames will make it unnecessary to entirely close the house even in the coldest weather. There is but little danger from the cold so long as the birds are at work and exercise not obtained in fresh air loses half its value.

These are important factors. Feed as carefully and as scientifically as you may, you cannot achieve success without them.

We cannot lay down a rule for feeding. What will produce good results in one yard will not always do so in another, because of varying conditions. Sufficient information upon the feeding values of all commercial foods and their effects upon the birds under various conditions has been published so that a little experience and intelligent observation will enable one to compound the ration best adapted for his use.

The problem of supplying green food in cold weather has been practically eliminated; clover and alfalfa cured green, and mangel wurzels and cabbage may be had throughout the winter and furnish the required elements in an acceptable form.

Birds constitutionally strong, provided with the foods and surrounded by the conditions intended for them by nature will produce offspring that will live and thrive.

VIGOROUS STOCK: GOOD HATCHES

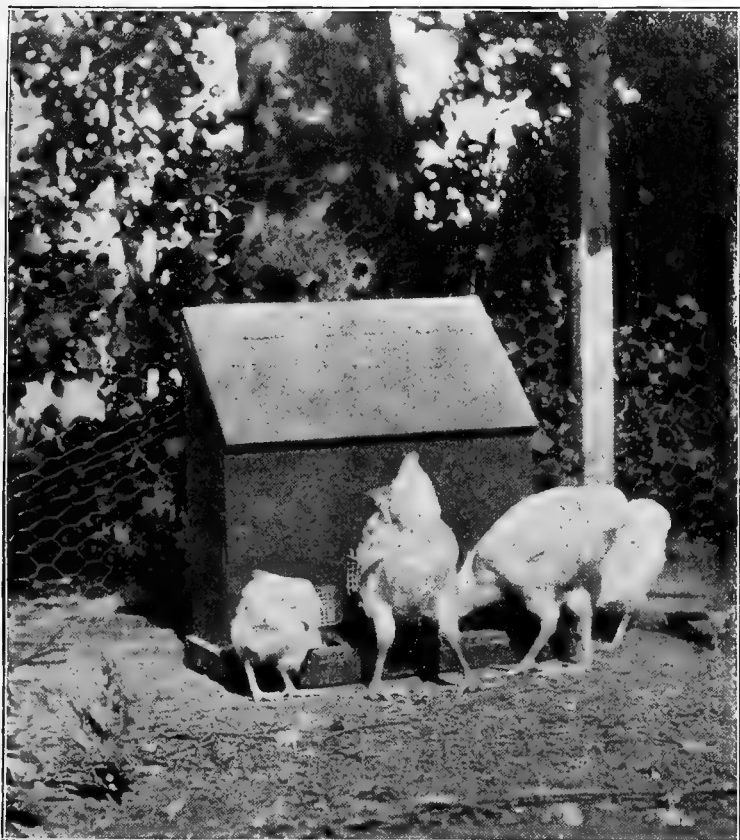
J. B. HEABERLIN

IT SEEMS to be a very hard matter for an amateur or any one for that matter, who has had no experience in the poultry business to believe anything but that an "egg is an egg" and should hatch a good, strong chick, not for a moment considering whence it came, and this very ignorance is what causes most of the complaints against good incubators. The writer is fully aware that there are some incubators on the market that would not hatch anything but trouble, for he has had this sad experience with a machine that turned out more egg fertilizer than chicks.

But that was years ago and I have fully recovered and further wish to say that I did not become discouraged and conclude that no one could do any better than I. I said to myself, the papers are full of advertisers who are doing all their hatching with incubators, therefore it can be done, and I am going to be one of them, for the novelty of hatching chicks artificially was just what tempted me to enter the business. The next month I found an article from the pen of one of our shining lights in the poultry world, giving the per centage he had hatched in incubators during the season just closed. I wrote him asking what make of machines he was using and also remarked that any information he would give me in the matter would be highly appreciated.

I received a prompt reply, giving me the information asked for, and he said: "Be sure that your breeding stock is healthy and vigorous and properly mated, and you will have no trouble." That set me to thinking. I went out into my chicken yard and sat down on a stump and began to scrutinize my flock in general. Now, right then and there it dawned upon me that one must know his fowls or he doesn't know his business. I then began to get better acquainted with my chickens and about the time I got pretty well acquainted with them I found out that I had no chickens worth breeding.

I must admit I felt somewhat discouraged, but I straightway passed a resolution in my mind resolving to get into the right pew. The next spring I bought first-class stock and eggs from the very best breeders in the country and with hard work and perseverance I have learned to know a good bird when I see it, and that when good birds are



16—CHICKS FEEDING FROM A HOPPER

ARTIFICIAL INCUBATING AND BROODING

properly mated the hatching of their eggs is mere play. But before I close, I want to say for the benefit of those concerned that I placed 220 eggs in my incubator and on the fourteenth day I tested out eighteen. On the twenty-first day I took out 172 White Rock chicks and I raised every chick to maturity except one—an 85 per cent. hatch. I have had other hatches just as good, but generally lose some before maturity.

HELP FOR BEGINNERS

CONDIMENTS ARE INJURIOUS—THE PROPER DIET FOR BREEDING FOWLS TO INSURE FERTILE EGGS

W. H. HARDIN

WE CANNOT hope to get strong, vigorous chicks, whether hatched artificially or by the natural method, unless our breeding stock is in the best possible condition. After years of experimenting the writer has become convinced that it is a mistake to feed condiments to any kind of breeding stock. In fact I do not believe in feeding these so-called egg-producing formulas even to laying stock from which eggs are to be sold for market purposes, as they simply irritate the egg producing organs and are sure to prove a detriment to your fowls sooner or later. Rather should you endeavor to improve the laying power of your flock by breeding each year from your best layers of the previous year. Such a method systematically carried out year after year will be sure to bring your fowls up to a high state of productiveness, which will be more satisfactory and it can be done without undue forcing.

I have had frequent inquiries from poultry keepers and the managers of two state experiment stations, asking for a proper diet for breeding fowls to insure a high percentage of fertility.

The feeding of fowls to bring about this desirable result is a question that has given many of us more or less trouble in times past, especially during the early spring when the fowls must be confined to their houses the greater portion of the time on account of bad weather. While I do not say that my method is perfection, yet it is one that I have adopted after carefully studying and experimenting, and it is giving me satisfactory results.

FEEDING FOR FERTILITY

To begin with, I feed only twice daily. I do not consider it good policy to feed fowls three times a day. The working meal of the day is whole grain, which is fed every morning as soon after daylight as possible, and it consists of a mixture

of wheat and coarsely cracked corn. One quart of this mixture is allowed to every twelve fowls and it is scattered in the litter of the scratching sheds, the floors of which are kept covered to the depth of six to eight inches. It takes the birds the better part of the day to find all these grains when they are well buried in the litter, which gives them plenty of exercise, and exercise they must have if you want fertile eggs and plenty of them. The working hen is almost invariably a good laying hen.

The evening meal is a mash of milling products, animal and vegetable food mixed by measure as follows:

Good wheat bran, two parts.

Ground oats, one part.

Second crop cut clover, two parts.

Corn meal, one part.

Best quality beef scrap, one part.

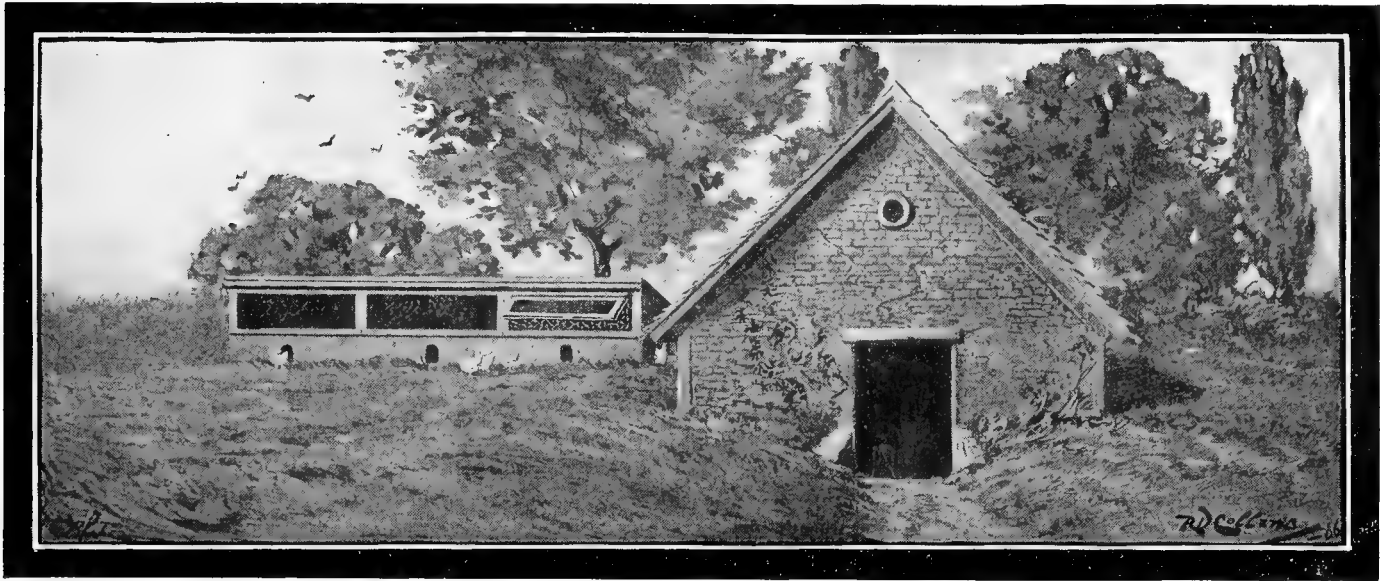
This soft mash is prepared by first putting into the feed bucket the proper quantity of cut clover, adding a small quantity of salt, or in other words, seasoning it about as you would for your own palate. Next we pour on the boiling water, covering the vessel and allowing it to stand half an hour or so and then add the other ingredients. Mix well to a crumbly consistency (not sloppy), and feed warm. There can be no fixed rule about the proper quantity to feed, as no two flocks will eat the same amount. However, I make it a rule to feed my birds just what they will eat up readily in from ten to fifteen minutes, being careful to remove any food that is not eaten, because if it is allowed to remain in the feed troughs it will sour and is liable to sicken the fowls.

Fresh, pure water should be kept before them all the time. The fowls can not be good layers if their water supply is stinted. Perhaps many of you have noticed that your hens that drink freely are generally the best layers. Be careful to keep the water vessels scrupulously clean. I make it a rule to scald mine two or three times a week. Bear in mind that filthy drinking vessels and filthy water are prolific sources of disease among poultry. Fowls that are confined to yards should have access to plenty of good, sharp grit at all times. They cannot be healthy without it. Ground oyster shell is also very healthful in many ways. During the winter and early spring I try to keep green food, such as cabbage, mangels, beets, etc., before my birds at all times. It is not only a great relish to them, but it assists in keeping their systems in good tone.

Twice a week I omit the beef scrap from the soft mash and on those days I feed instead a liberal quantity of green cut bone in the proportion of about one ounce to each fowl. They are extremely fond of it and it is one of the best natural egg producers that can be fed, and it assists wonderfully in the matter of fertility of the eggs, especially during the winter and early spring before the insects come.



INCUBATOR AND BROODING HOUSES



MODERN INCUBATOR HOUSES

DETAILS AND PLANS OF INCUBATOR HOUSE THAT IS MODEL OF CONVENIENCE—
SAVING TIME OF OPERATOR—MATERIALS REQUIRED FOR INCUBATOR HOUSE—THE
INCUBATOR CELLAR — SMALL INCUBATOR HOUSE — HOW CONSTRUCTED, ETC.

While any piece of machinery will perform its destined work for a time under sudden severe changes of temperature, exposed to dampness and inclement weather, still anything made of wood and metal is necessarily perishable and it shows good sense for us to operate any machine under the most favorable conditions possible. To obtain the best results with an incubator, we should place it in the best location possible.

Everyone cannot build an incubator cellar for one or two machines, but each can use common sense in locating the machines in a well ventilated cellar room, and with the aid of a thermometer keep the surrounding temperature from varying many degrees. Do not put the machines in the attic in the summer nor in an unheated out-house in the dead of winter.

You may get an excellent hatch under the most adverse condition, but you are unfair to the machine and its manufacturer.—Editor.



WHILE many illustrations of incubator cellars or houses have been published from time to time, we do not recall that any plans have ever been offered which showed a dark room for testing eggs.

The incubator house shown in accompanying plans, was designed by Dr. P. T. Woods, and a house of this pattern is now in successful operation at the Millville Poultry Farm.

On all plants where a considerable number of machines are run, the testing of eggs becomes an item of considerable labor and consumes a large amount of time. If this testing has to be done at night, it lengthens the hours for the poultryman so much that during the hatching season he loses a great deal of much needed rest, whereas if some means are provided for testing the eggs during the day, there are usually odd moments

when the work can be done without interference with the regular routine of the plant. It was for this purpose of saving night work on the poultry farm that the incubator house with dark room was devised. This house, or more properly, half-cellar, is a frame building built above a brick foundation, a slight excavation being made and a 2 feet 6 inch or 3 feet brick wall built, against which the earth is banked up on the outside and on which the sills of the frame building are laid.

The sills are laid in cement to make a tight joint. The sides of the building are sheathed with rabbeted pine boards laid lengthwise on both sides of the studs. The lower board reaches below the sill and laps over brick work to avoid draughts.

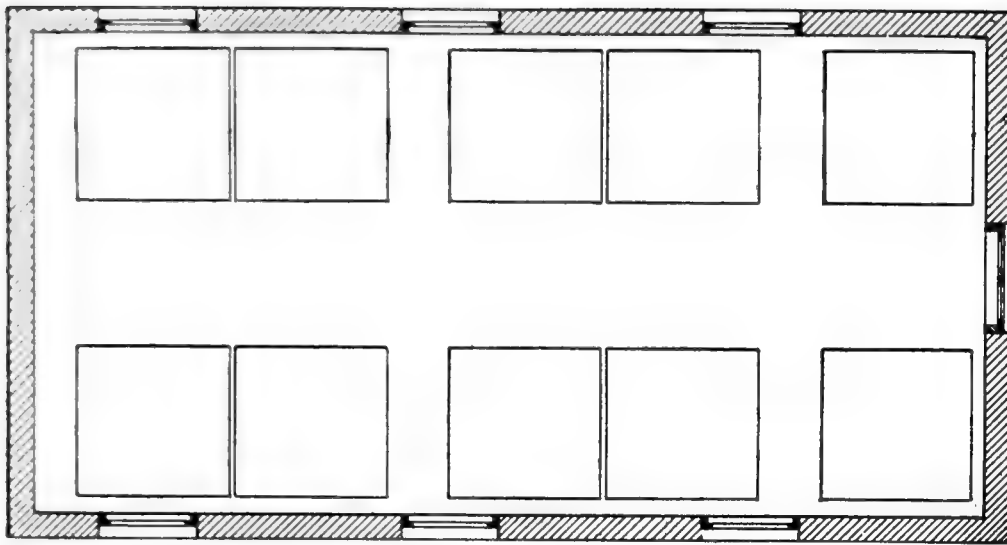
The roof is of rough boards laid on rafters which are placed 2 feet apart and is covered with a good quality of shingles.

These rafters and frame are afforded additional support by tie beams, as indicated in plan. (Ill. 18.)

The nine windows of the building are all double windows, the outer windows being hinged at the top, the inner ones hinged at the bottom, so that they may be opened as shown in plan (Ill. 18). The space beneath the roof is not ceiled in, the portion between the rafters and tie beams being left open so that the air from the windows may be deflected up against the roof. In such a building the windows may be left open on both sides of the building, affording excellent ventilation and at the same time not permitting any direct draught to blow upon the machines. The large door in the end of the building is provided with double doors, the inner one having ventilating holes as shown in Ill. 18. The house is 59 feet long by 21 feet wide and 7 feet 6 inches from the floor to eaves, inside measurement. The floor is made of cement or hard packed gravel.

The dark room is 6 by 8 feet and is ceiled up with matched boards to the rafters. It is provided with a wide door, which for purposes of ventilation is best made of a stout frame covered with burlap or bran sacking. In one end of the room

ARTIFICIAL INCUBATING AND BROODING



17—GROUND PLAN OF CELLAR FOR TEN LARGE INCUBATORS

there should be two shelves, one just high enough to place the egg tester on, and have the eggs come in direct line with the eye when the operator is seated on an ordinary high stool, and he will be able to pass the eggs before the light very rapidly.

The second shelf should be beneath this and should be of sufficient size to accommodate two incubator trays, one full and one empty, and a basket having two compartments, one for infertile eggs and one for dead germs. It is very little trouble to furnish a dark room in an incubator cellar, in this manner and the expense is small. Such a room should be ventilated by a hinged window, the glass of which has been painted black or has a black cloth tacked over it. It is surprising what an amount of labor such a room, properly equipped, will save in course of a season in running a number of incubators. Provision can also be made for testing by aid of direct or reflected sunlight by having in the outer window a special pane fitted, with an opening like that in the egg tester and a mirror arranged outside the building to reflect the rays of the sun. The writer ran twenty large machines in an incubator cellar equipped with a dark room as above described and by keeping a careful record of the time spent in the incubator cellar he was surprised to find that, after doing all the work required, filling the lamps, trimming them, attending to the regulation of the machines, filling the machines, turning the eggs, testing them and everything necessary from starting the eggs until the chicks were ready to be taken to the the brooders, the average time required per machine was not over ten minutes per day.

Other useful furniture in the incubator cellar which made it possible to handle the machines so easily, was a plain pine board table and a five-gallon oil can having a quick flow, easily controlled spigot. This table was placed in the centre of the incubator cellar. Ill. 16. The machines were rights and lefts, arranged along the sides of the room which was a little over 50 feet in length. The lamps of the machines at one end of the table were quickly filled and trimmed by carrying them to the table one at a time, the oil can resting on the end nearest the operator, then the can was transferred to the opposite end of the table and the lamps of the machines on that end were cared for. This is a small matter, yet it proved to be the means of saving a considerable amount of labor. The lamps

being carried to the table to be filled could then be set on a firm surface for cleaning, which was quickly accomplished by means of a pocket knife and a soft cloth. With a cement floor and the table on rollers or small wheels it would be still more convenient.

Such an incubator house will be found a most satisfactory style to run, it being easy to have perfect ventilation at all times and very little difficulty in keeping the heat at an even temperature even in warm weather. The building in use at Millville is giving very satisfactory results and excellent hatches have been obtained when the temperature outside the building registered close to 100 degrees for days at a time.

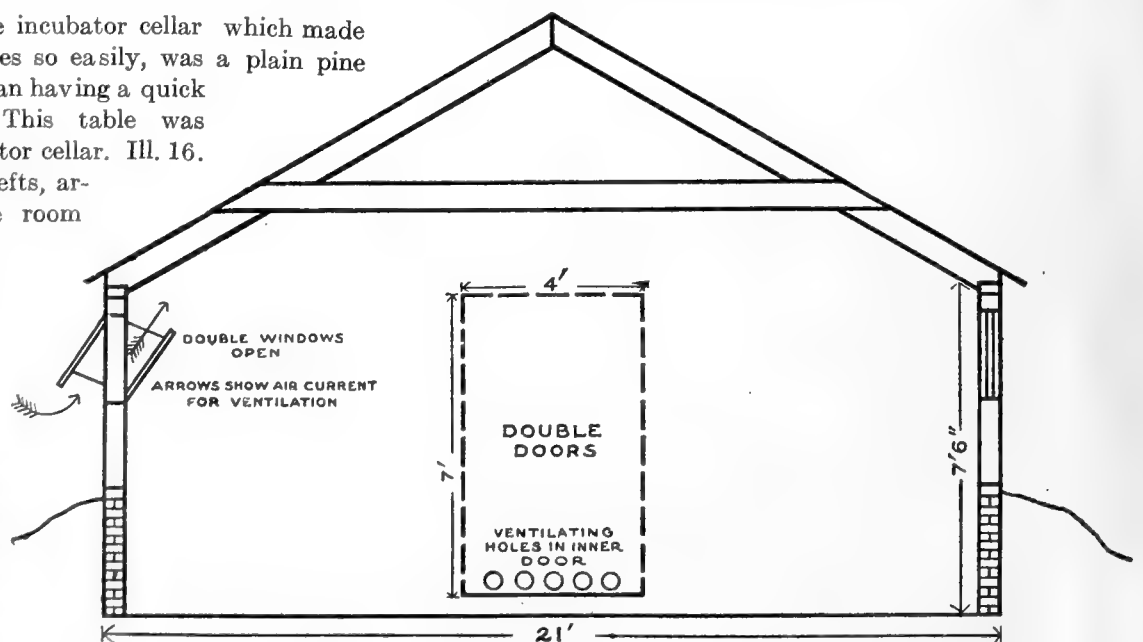
INCUBATOR CELLAR

All things considered, the cellar shown herewith is one of the best that has been devised for the purpose. The temperature keeps very even and there is just enough natural moisture in the air to give the best results. To build it requires an excavation 3 feet deep and the building of a wall 5 feet high with an additional 2 feet of wood work above it. Bank the earth up against the wall so as to make the cellar 5 feet deep.

The door is in one end of the building and the stairs are inside so that they are safe from the weather. Four cellar windows are used on each side and are double glass, being placed on each side of the window frame. The inside of the room of the cellar is ceiled with matched stuff. The ceiling runs inside of plate up studs and rafters to a point 10 feet from the floor, where it crosses on the tie beams. The roof ends and sides may be either shingled or papered. In such an incubator cellar it is well to have the incubators lefts and rights for greater convenience in the care of them.

MATERIALS REQUIRED FOR 36-FOOT INCUBATOR CELLAR

- Sills and Plates—4 pieces 2 by 6, 14 feet; 16 pieces 2 by 6, 12 feet
- Rafters— 38 pieces 2 by 6, 16 feet.
- Collar-beams and Ties—24 pieces 1 by 6, 16 feet.
- Roof Boards—1,300 feet, No. 1 barn siding.
- Sides and Ends—400 feet matched stuff.



18—SECTIONAL VIEW SHOWING VENTILATING SYSTEM

INCUBATOR AND BROODING HOUSES

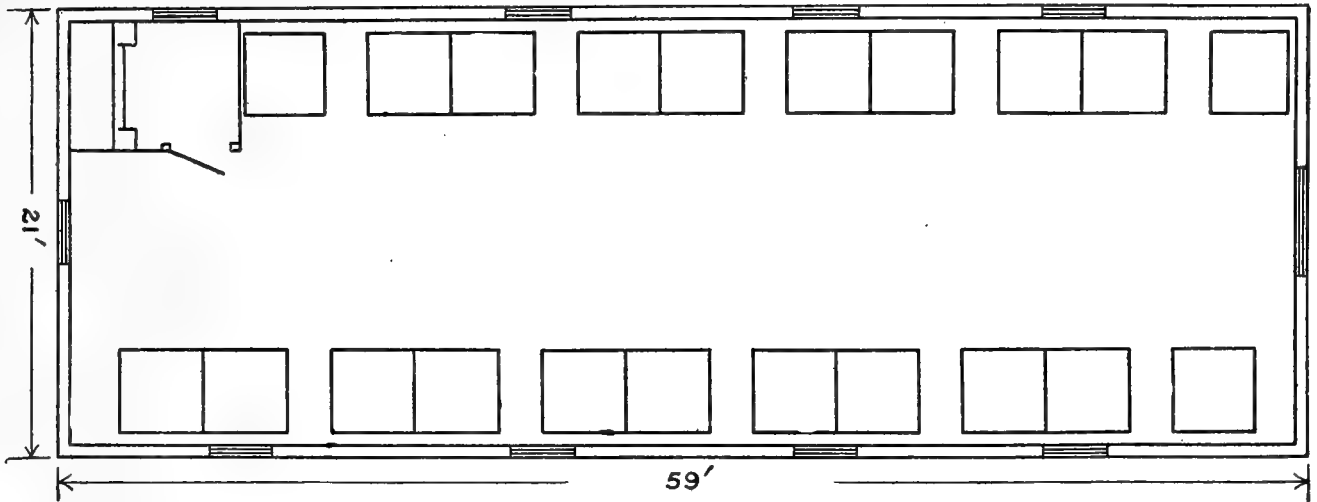
Ceiling—1,400 feet, $\frac{3}{8}$ ceiling.

Shingles—12 thousand.

Paper—3 rolls, 500 square feet each.

One door, 5 feet 6 inches by 6 feet 6 inches.

Eight windows, 3 lights 9 by 13.



SMALL INCUBATOR HOUSES

20—GROUND PLAN FOR LARGE INCUBATOR CELLAR

Incubator houses are best made in half cellars, and when possible should be put up early in the season on dry, high ground.

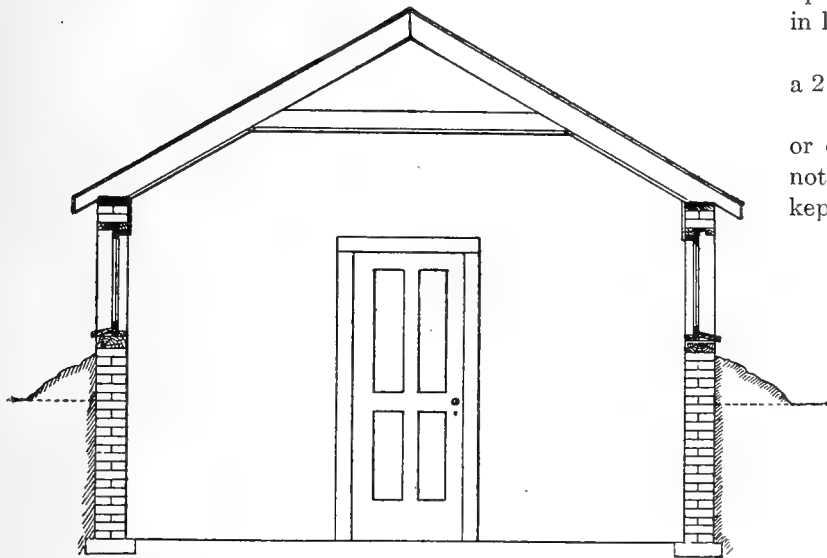
It is often desirable to hatch late in the spring or even in the summer, and a house entirely above ground then gets too warm for the best work. With a half cellar the air strikes the walls, which the outer ground keeps cool, and the temperature can be kept down to 60 or 65 degrees, excepting in the very warmest weather. A row of windows is placed on either side

well up toward the ceiling, so that a window can be opened on either side of the house to afford ventilation without a draught striking the machines.

In Ill. 19 we present a sectional view of a single incubator cellar which can be made to hold from six to twelve or fourteen incubators. Ill. 17 shows the ground plan arranged for ten large incubators. The house should be 12 feet 6 inches in the clear on the inside by 25 feet in length. If it is desirable to put up a house for only six incubators it will need to be only 15 feet in length. A large incubator practically takes up 5 feet of room.

The incubator house should set 3 feet in the ground with a 2 foot banked wall above, making 5 feet in all under ground.

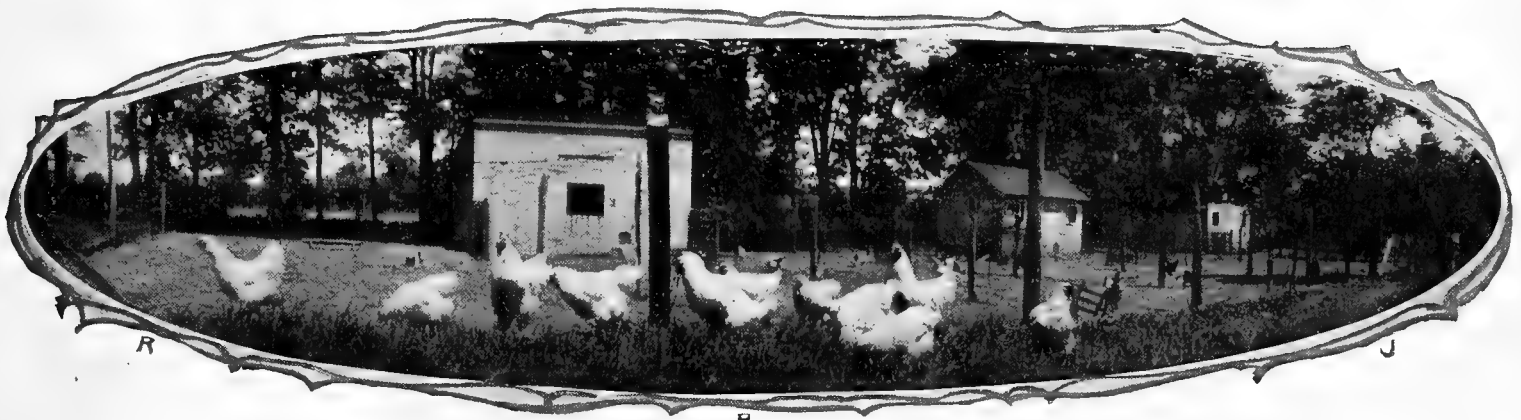
There should be 8 feet head room from the floor to the plates or ceiling. Do not build a lower ceiling, as a lower room will not give sufficient cubic feet of air space to allow the air to be kept fresh.



19—SECTIONAL VIEW OF SINGLE INCUBATOR CELLAR

MATERIAL REQUIRED FOR 20-FOOT SINGLE INCUBATOR HOUSE

- 24 pieces 2 by 6, 10-foot hemlock for rafters.
- 16 pieces 2 by 4, 16-foot hemlock for collars.
- 10 pieces 2 by 4, 12-foot hemlock for studding.
- 650 feet hemlock for sheathing.
- 3,600 shingles, or five rolls roofing paper.
- 200 feet siding.
- 4 windows.
- 400 feet matched ceiling.
- 10,000 brick.
- 10 barrels lime.
- 10 loads sand.



A SUCCESSFUL BROODER HOUSE

A SIX PEN BROODER HOUSE THAT WAS THOROUGHLY TESTED AT THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION—A DEPRESSED ALLEYWAY MAKES IT POSSIBLE FOR OPERATOR TO ATTEND TO BROODERS AND LAMPS WITHOUT STOOPING

F. H. STONEBURN

This article is partly taken from a bulletin published by the Storrs Agricultural College of Connecticut. The author, Mr. F. H. Stoneburn, was for three years in charge of the practical poultry work carried on by the College, but later resigned his position to become director of the Columbia School of Poultry Culture.—Editor.

THE arrangements for artificial brooding are of as great importance as the equipment of any other branch of the poultry farm. Adult fowls, vigorous and well protected by nature, may survive and even thrive under adverse conditions, but the tiny chicks must have careful treatment.

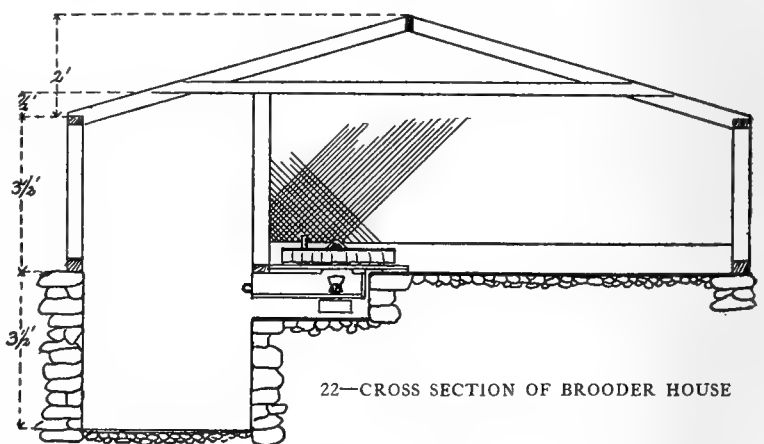
The importance of the brooder house is emphasized when we consider that everyone engaged in commercial poultry keeping desires to produce a large proportion of his annual crop of chickens at some time of the year other than the natural breeding season of his fowls. This is true whether the main object be the production of meat or of eggs. Fall-hatched chicks are carried through the winter to be sold in the spring as roasters; winter-hatched chicks are marketed as early broilers; while the early spring-hatched stock is either marketed at the broiler age or carried to maturity to be used as breeders or egg producers. The production of any large amount of this out-of-season stock by natural methods of rearing is, of course, out of the question, and the incubator and the brooder must be relied upon largely. The facilities for brooding the chicks vary according to the needs and resources of the different owners, ranging from a jug of hot water in a tight box to the huge pipe-system brooder houses found upon the leading poultry plants. But, unfortunately, in too many cases these brooding systems are inadequate, being poorly designed or improperly constructed. As a result the mortality among chicks entrusted to them is so excessive that it cuts down the profits materially. In fact, observation leads one to believe that the greatest source of loss on the average poultry plant is to be found in the heavy mortality among chicks under two months of age.

A brooder building designed for the rearing of chicks during the cold months should embody several distinct features. For the health and well-being of the chicks it should be so constructed that the temperature and ventilation can be absolutely controlled, plenty of sunshine admitted, and enemies of all kinds kept out. For the comfort of the attendant and the economical conduct of the business it should be convenient in every way. Under this latter head are grouped many factors, because convenience in this case must include caring for the lamps and hovers, feed-

ing and watering the chicks, managing the doors and windows, and keeping the house in a thoroughly sanitary condition. It is the object of this article to describe briefly a building which seems to embody most of the requirements enumerated above.

It was decided best to use small lamp brooders in each pen, as this enables the attendant to manage each pen of chicks independently of the rest. For the above reason the plan should commend itself to those who are in the business on a comparatively small scale, as well as to the large operator who feels the need of a nursery brooder where the hover temperature can be regulated according to the needs of each pen of chicks.

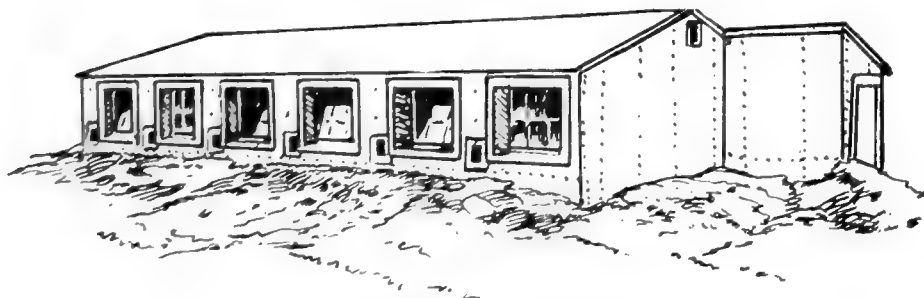
The house is built 15 by 30 feet in size, with a 4 by 5 feet extension on the east side. This latter is used as an entry or "ante-room," permitting the poultryman to pass in and out of the house at will during bad weather without exposing the



chicks to draughts. An alley-way 4 feet in width extends along the entire north side, and the rest of the floor space is divided into pens. They are six in number and are 5 by 11 feet in size.

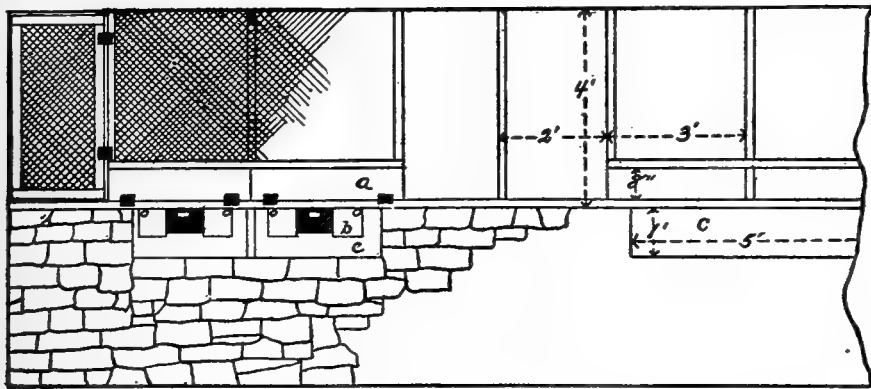
An examination of the accompanying cuts will show that the vital feature of the building is the elevated chick floor, the latter being 3 feet 6 inches above the former. This arrangement secures several advantages. It enables the attendant to care for the brooders and feed the chicks without the constant stooping required where the brooders are operated upon the floor in the usual manner. Further, it reduces the enclosed air space by fully one third, effecting a corresponding saving in the amount of heat required to maintain a given temperature. It also places the chicks nearer the ceiling—the warmest part of the room—thus giving them the benefit of all the available warmth.

Repeated tests in the house under discussion demonstrated that in cold weather the temperature at the level of the alley floor is 14 degrees lower than at the chick floor but 3 feet 6 inches above. And finally, the amount of side wall exposed to the weather is reduced one-half, quite a consideration in wind-swept positions. The disadvantage of the plan becomes evident only when it is found necessary to enter the pens for any purpose. It is inconvenient because of the necessary climb to enter the pen and the confined space in which to do the work. It has, however, been found unnecessary to get into



21—A SUCCESSFUL BROODER HOUSE

INCUBATOR AND BROODING HOUSES



23—SECTION OF BROODER HOUSE SHOWING SOUTH SIDE OF ALLEYWAY

the pens except on rare occasions, so this is not a serious draw back.

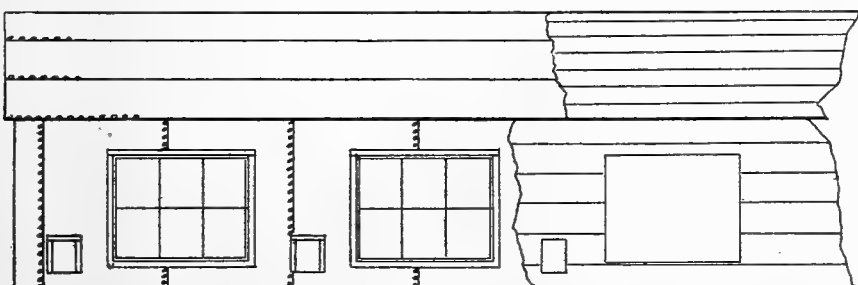
The site selected for this house is a knoll sloping slightly to the north and abruptly to the east. The alley was formed by digging a trench of the required depth along the north side of the site of the proposed structure. Parallel stone walls 4 feet apart were then laid in this trench and carried to a height of 3 feet 6 inches. These were joined by a wall of the same height at the west end, the east end being reserved as a doorway. When laying the wall on the south side of the alley, provision was made for three lamp pits, each 2 feet 6 inches by 5 feet and 1 foot in depth, as indicated upon the plans. Each pit accommodates the heaters of two brooders.

The rest of the foundation is a simple wall varying in height according to the slope of the land, but carried to the same level as the alley wall. Finally the entire floor was cemented, including the bottoms of the lamp pits, the cement in the chick pens being at the level of the top of the foundation walls.

Because of the small size of the building, the frame is constructed entirely of 2 by 4 inch material, except the sills, which are 4 by 4 inches. The walls are 3 feet 6 inches in height. The roof is an even span, with a rise of 2 feet. The rafters are tied with collar beams which are spiked on level 7 feet 6 inches from the alley floor. The entire frame is covered with $\frac{7}{8}$ -inch matched boards, with one-ply Flintkote upon the roof and an extra heavy felt upon the sides. This gives an absolutely wind-proof structure. Eaves-troughs are required to carry from the roof the water which might otherwise make its way into the building.

The interior is lathed and plastered with fire proof asbestos plaster. By carrying the plaster across on the collar beams an attic is formed which is of great value in controlling the temperature, preventing direct radiation through the roof. A large sliding ventilator opens into this attic through the ceiling above each pair of chick pens, and in each gable doors are placed, opening into the attic from outside. These are regulated according to the weather. This forms a decidedly effective ventilating system which is entirely under control.

In the south side of the building are six windows, one for each pen, each a single sash with six panes of 10 by 12 inch glass.

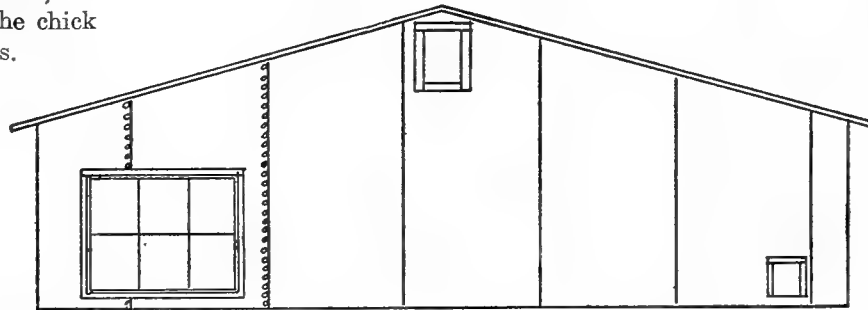


24—SOUTH ELEVATION OF BROODER HOUSE

These windows are hinged at the bottom and swing inward, being controlled from the alley by cords. At the west end of the alley another window of the same size is placed. This lights the alley thoroughly, which is very desirable, particularly on dark, winter days. Chick doors are 6 by 7 inches in size, and are also operated by cords. The construction of pen partitions is so fully illustrated by the cuts that no further explanation seems necessary. The door is made nearly as wide as the alley to permit the easy passage of wheelbarrows for cleaning.

The brooders were constructed by the college carpenter. They consist simply of the heaters and hovers mounted upon platforms, no sides or top being required. Because the heaters are suspended in the lamp pits, the floors of the brooders are elevated but 2 inches above the floors of the pens, which enables the chicks to enter the hovers without climbing the usual bridge. The pen floors are kept covered with 1 inch of sand and more or less fine litter, such as chaff, cut straw, etc. In ordinary weather the six lamps maintain the temperature sufficiently high, but an auxiliary heater is supplied for use in extreme cold. This is a stove placed near the west end of the alley, and a small fire in it will keep the building sufficiently warm at any time.

For the needs of the practical farmer or poultryman some slight change might be made in the above plan. The alley could be reduced to 3 feet in width, and still be large enough to accommodate one attendant. The length of the chick pens might be reduced 1 or 2 feet, thus making the building narrow-



25—WEST ELEVATION OF BROODER HOUSE

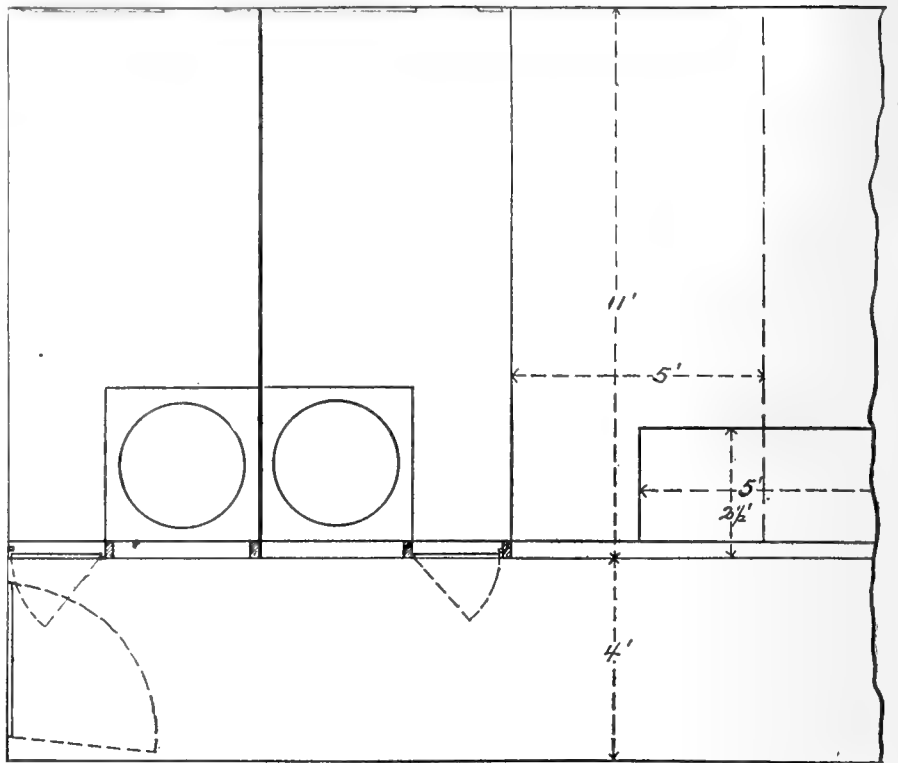
er. The depth of the alley might be made 3 feet instead of 3 feet 6 inches, and the sides made of heavy plank instead of masonry. The cement floor could be replaced with an earth floor, provided rats could be repelled. The entry extension could be dispensed with. For ordinary uses in southern New England the wall might be satisfactory if constructed of two thicknesses of inch boards with paper between. All of the above changes would result in a financial saving so far as the first cost of the building is concerned, but, excepting the reduction in width of alley, they would also cause a decreased efficiency.

Not infrequently poultrymen have attempted to secure the benefits to be gained from an elevated chick floor in the brooder house by constructing board floors at various heights. In some instances the brooders have been set upon tables and passage ways left open at each side of the building, one permitting the attendant to care for the lamp, clean the brooder, etc., and the other to feed and water the chicks in the pens. Such arrangements have proved to be quite satisfactory, but are expensive and have one very decided disadvantage, namely, it is impossible to give the chicks an outside run unless they are compelled to climb to an elevation of 2 or 3 feet when returning to the brooder. Every experienced poultryman will understand how

ARTIFICIAL INCUBATING AND BROODING

impracticable this is. The hillside brooder house, however, permits the chicks to step right out at the ground level, there being no bridges to climb. It is evident that a slight slope to the north is the best location for a house of this kind, if it is desired to have the house face the south. However, either an east or west slope can be utilized if a small amount of grading is done. It is imperative that the site be well drained, otherwise water will collect in the depressed alleyway. It might be possible to erect a building of this kind upon perfectly level ground by digging a trench of sufficient size to serve as the alleyway if ample drainage could be provided by laying a line of tile to some lower point. Of course, under these conditions, steps would have to be used which would not be as convenient as having an entrance upon the level as in the building described above.

Since this bulletin has appeared I have received several letters containing questions about the house, and I will mention one or two matters not fully touched upon in the bulletin. Kindly refer to the illustration "Section showing south side of alleyway." The lamp boxes suspended in lamp pit (c) occupy but a part of it, allowing ample circulation of air around the boxes. Lamp fumes are permitted to escape into the alley through the openings in the corners of the lamp boxes; one of these can be seen at the upper right hand corner of the box (b). The "clean out" doors (a) are directly behind the hover and are hinged at the bottom. These drop down and permit the attendant to clean the brooder very conveniently. The wire netting above these "clean out" doors is securely tacked in place. As each pen is 5 feet in width and the brooder itself a scanty 3 feet, there is sufficient room for the 2-foot front door shown on the



26—PLAN OF BROODER HOUSE

left. This door should be swung outward, being hinged on the side next the brooder. Thus each door can be thrown wide open, swinging around against the brooder, without interfering with the other doors.

The lamp fumes and vitiated air naturally rise to the ceiling and are permitted to escape through the slide covered ventilator which is above the partition between the two pens. A similar ventilator is placed above each pair of brooders.

THE HEATING OF BROODING HOUSES

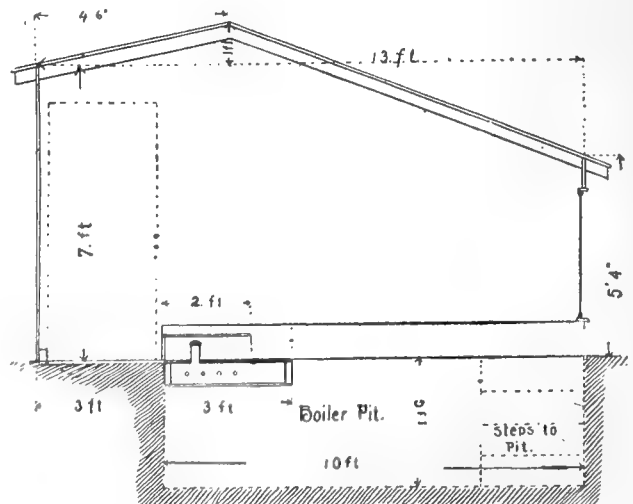
THE MOST SUCCESSFUL DESIGNS OF UNDERNEATH AND OVERHEAD HEATING SYSTEMS FOR BROODING HOUSES—THE ADVANTAGES OF EACH AND A COMPARISON OF THEIR MERITS—SUMMARY OF MATERIAL REQUIRED FOR 100-FOOT HOUSE

THE UNDERNEATH SYSTEM

THE brooding house illustrated in the accompanying plan is 140 feet long and 13 feet wide and is separated into two parts, 36 feet and 104 feet respectively. The shorter end has twelve pens of 3 feet each in width and 10 feet in length including the hover, and the longer end has twenty-four pens 4 by 10 feet in size. The furnace pit and a narrow walk separate the two lots of pens and an aisle 3 feet in width extends the entire length of the house back of the hovers.

The system of piping is under the hover floor in a trench (N, Ill. 28). The shorter end has a 2-inch flow and return pipe. The long end has two flow and two return 1 1/2-inch pipes (see Ill. 29), and both sides are controlled by valves near the heater, whereby all, or a part of the flow may be shut off from the pipes. The trench is made by excavating to a depth of 6 inches and 36 inches wide. The sides are 2 by 6 inch spruce plank, set on edge (OO). The bottom of the trench is cemented (H). The top is boarded with a course of rough 1-inch boards, and covered with a layer of matched spruce flooring seven-eighths inch (K). This double boarding takes away any danger

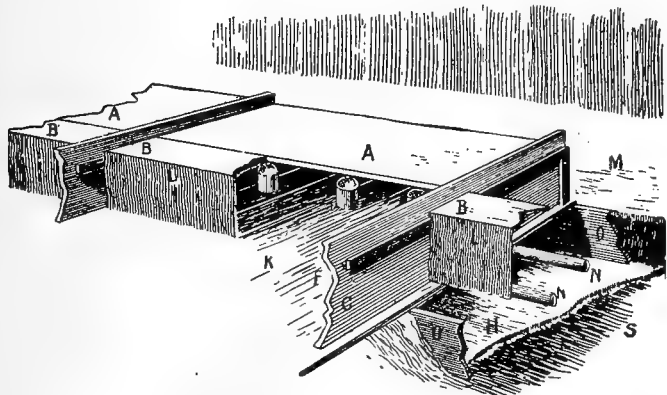
from too much bottom heat. The boarding comes flush with the edges of the 2 by 6 inch and the frame work of the hovers, is secured by 1 by 3 inch posts nailed to the outer sides of the 2 by 6, which are only as high as the hover divisions (C), which in the small pens are 10 inches and in the large pens 12 inches.



27—SECTIONAL VIEW BROODING HOUSE (UNDERNEATH HEATING SYSTEM)

INCUBATOR AND BROODING HOUSES

This gives a house entirely free from inside posts and makes possible a view of the whole interior from any part. The hover floor is 3 feet wide (the width of the trench) and in the 3-foot pens the hover top slides on cleats (F) 6 inches from the floor. The top or cover is only 24 inches wide, which leaves 12 inches of the slightly warm floor in front of the hover curtain, making a splendid resting place for the little chicks or ducklings which

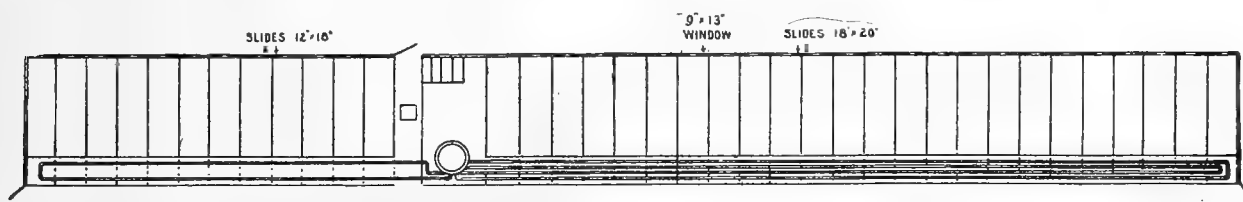


28—DETAIL OF HOVER OF UNDERNEATH HEATING SYSTEM BROODING HOUSE

they evidently enjoy. When first they are put in the hover they are penned back nearly to this floor and the gentle warmth helps them and keeps the floor free from dampness. The cover being in two parts (A and B) and sliding freely on cleats (F) may be readily adjusted so as to give ventilation at the back, front or center of the hover, or all three, and the surplus heat may escape in the same way.

The hover floor is kept littered with chaff or shavings and when the pen is to be cleaned the hover top is removed, the back board which sets between the cleats can be taken out and the litter swept into the aisle and taken thence in barrels. When the little chicks are to be changed from pen to pen, the back boards are taken out and they are driven down the aisle from one pen to another, which in the long end of the house are 4 feet wide and the hover 8 inches high, but are otherwise the same as the short end. The illustration shows a hover closed, one with the top partly cut away and one with the top off and the back out, ready for cleaning.

The hot air is admitted to the hovers through the upright 1½-inch pipes seen in the lower floor. These pipes reach nearly to the cover of the hover and the bottom ends just reach through the board floor, being flush with the under side. Back of each second hover (on the division post, so as to be out of the way), is a 2 by 3 air box which reaches down under the 2 by 6 side and permits the cold air to enter the trench. This gives a chance for the warm air in the trench to rise through the short, upright pipes under the hover and draw in cold air from the aisle, making a perfect circulation. The warm air strikes the hover cover and deflecting, makes a perfectly warm box on all sides of the little chick and yet exposes his body to no direct heat. The variation allowed by the slide cover permits of ventilation and the escape of surplus heat at the will of the operator. In very hot nights the cover may be removed altogether. For the older chicks no curtain is supplied for the hover front, and this arrangement leaves the front entirely open in warm weather.



29—GROUND PLAN OF BROODING HOUSE (UNDERNEATH HEATING SYSTEM) FOR EITHER CHICKS OR DUCKLINGS

MATERIAL REQUIRED FOR 100-FOOT HOUSE

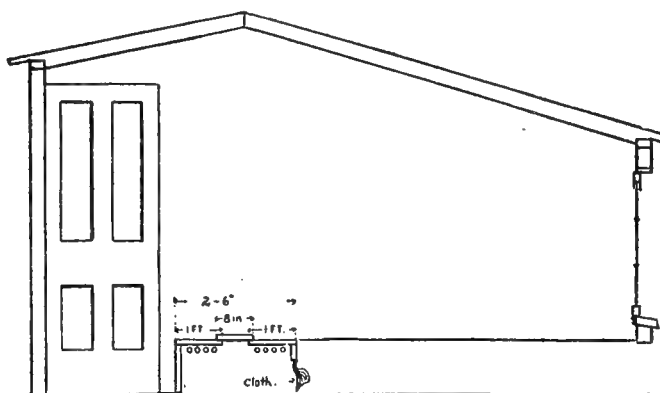
Sills, 12 pieces, 3 by 4, 18 feet; 2 pieces, 3 by 4, 14 feet.
 Plates, 12 pieces, 2 by 4, 18 feet; 2 pieces, 2 by 4, 14 feet.
 Studs, (10 feet to centers,) 11 pieces, 2 by 4, 6 feet 3 inches; 30 pieces, 2 by 3, 4 feet 7 inches.
 Girts, 10 pieces, 2 by 3, 12 feet.
 Rafters, 51 pieces, 2 by 4, 16 feet.
 Extra for slides, door frames, etc., 8 pieces, 2 by 3, 16 feet.
 Rafter ties, 49 pieces, 1 by 6, 7 feet.
 Boards, outside, 700 feet 14-foot, 2300 feet 16-foot; inside, 524 feet; total, plain, 3524 feet: matched, 900; if ceiled inside add 2400 feet.
 Board up and down. Roof length-wise.
 Paper, roof, 1500 feet; balance 1400 feet.
 Doors, three 3 by 6 feet 6 inches, one 2 by 5.
 Wire netting to suit use, 1-inch mesh.

HOVER WORK

Sills, 12 pieces, 2 by 6, 16 feet.
 Floor, 300 feet, 12 feet.
 Covers, divisions and back, matched 500 feet, 12 feet.
 Pen division boards, 14 pieces, 1 by 12, 16 feet.
 Windows, 14 12-light, 9 by 13; 6 rear windows 6-light, 9 by 13; 2 end windows, 6-light, 9 by 13.
 Cement floor under all, 1300 feet.
 Pit wall 18 inches, 5 by 8 feet, 5 feet deep, pointed.
 Walk across pit and stairs, 5 pieces, 2 by 6, 16 feet.
 Heating and piping to suit.

OVERHEAD PIPING SYSTEM

This brooding house may be built exactly like the one containing the underneath piping system described heretofore. The only difference is the arrangement of the hot water pipes, and the necessary difference in the construction of the brooders.

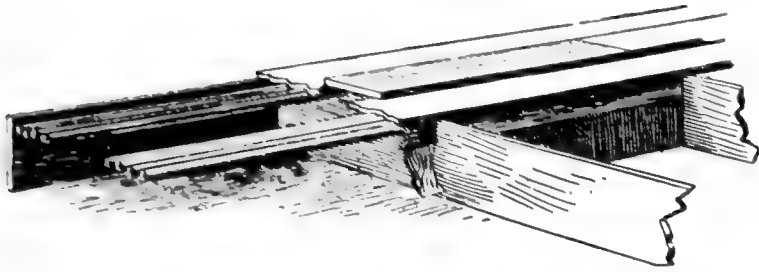


30—SECTIONAL VIEW, SHOWING OVERHEAD HEATING SYSTEM

In the accompanying illustration the overhead piping system is used. The construction of the hovers is very simple. The back is formed of 1-inch boards 12 inches wide and the divisions between the brooders are made of the same size boards, in which have been bored eight holes to receive the four flow and four return pipes. A narrow board is let in to the division boards 2 feet 6 inches from the rear wall of the brooder. To this is tacked the felt which hangs to the floor of the brooder and is

slashed for the accommodation of the chicks in passing to and fro. Over the pipes are placed foot-wide boards and resting on the edges of these are

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31—DETAIL OF HOVER CONSTRUCTION. OVERHEAD HEATING SYSTEM

boards which bridge the opening. By moving these boards, which are loose, ventilation may be obtained at the back, front or middle of the hover, and the cleaning of the brooders is greatly facilitated. This is quite a saving on a large plant.

In the short end of the house chaff or sand is placed in the

brooders to the depth of 5 or 6 inches, so that the smallest birds are brought near the pipes and as they grow the amount of litter is decreased, thus giving them more room and taking them further from the heat.

BILL OF MATERIAL

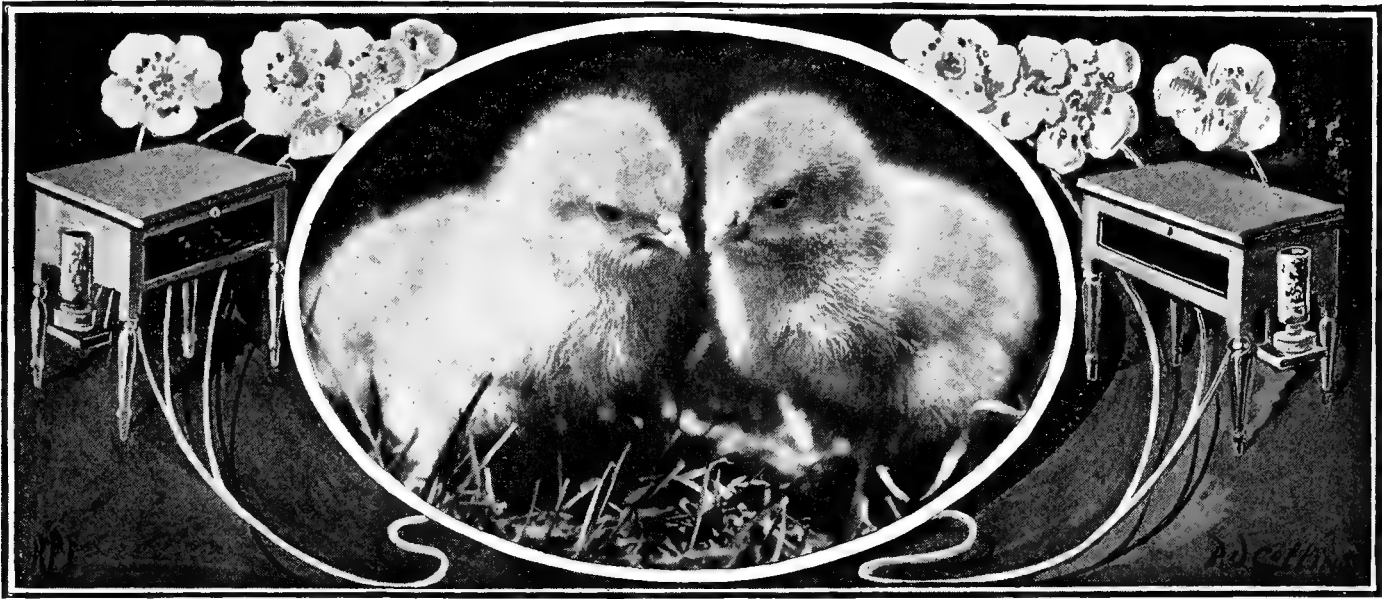
Sills—20 pieces, 2 by 6, 16 feet. Plates and Girders—38 pieces, 2 by 4, 16 feet. Rafters—72 pieces 2 by 4, 16 feet. Partitions to Pens—37 boards, $\frac{7}{8}$ by 12, 10 feet. Supports for Roof through Center of House—10 pieces 2 by 4, 16 feet. Sides and Top to Hover—30 boards $\frac{7}{8}$ by 12, 14 feet; 10 boards, $\frac{7}{8}$ by 8, 14 feet. Roof Boards—2,200 feet boxing; 21,000 shingles. Sides and Ends—2,400 1-inch boards, matched; 6 rolls paper of 500 square feet each. 20 window sashes, 6 lights, 9 by 13. One door, 2 feet 6 inches by 6 feet 6 inches. 2,600 brick for 8-inch wall to broiler pit.



32—GROUND PLAN OF BROODING HOUSE WITH OVERHEAD HEATING SYSTEM



ARTIFICIAL INCUBATION



SUCCESSFUL ARTIFICIAL INCUBATION

COMMON SENSE ADVICE ON INCUBATOR MANAGEMENT, INCLUDING LOCATION, OPERATION, CARE OF THE LAMP, SELECTION OF EGGS, TURNING AND COOLING THE EGGS, TESTING AND CARE OF THE MACHINE DURING HATCHING TIME

P. T. WOODS, M. D.

FEBRUARY usually brings the question of starting with an incubator into prominence and the hatching season should then be begun in earnest. Early pullets must be hatched in March and April to make fall and winter layers and take the place of older breeding stock which is to be marketed. The early cockerels will bring the best profits as fancy spring chickens, and the profits on sale of such should practically pay the cost of the food consumed by the pullets. For this reason if you intend using an incubator the first season, and wish to make it pay you a handsome profit, February is the time to start.

BUYING AN INCUBATOR

What machine and what size to buy are two questions that are not easily settled. In selecting the make of machine the beginner must be guided by his own best judgment. It is a good plan to study the manufacturers' advertising catalogues carefully, read the testimonials and note what date they bear. Then call on the nearest successful poultryman in your locality and observe for yourself what they are using and learn the results obtained. Try to get a fair unbiased opinion from reputable men whom you know and whose advice you are willing to follow. If you do this you can't go wrong.

In buying an incubator do not buy too small a machine. Fifty eggs will hatch just as well in a 100 or 200-egg machine as in a 50-egg size and you have room to set more if you want to. It is a decided mistake to buy too small a machine. There is very little difference in the time required for operating the various sizes and as a rule the lamp of a 100-egg size incubator will consume just as much oil as the lamp of a 200 or 300-egg size. There is very little difference in the operating expenses, and if the machine is a modern standard make you can rely on getting equally good results in all sizes. As a general rule the

100-egg capacity machines are sufficiently small for any town lot fancier, although the 50 and 60-egg incubators do excellent work and are found entirely satisfactory by many operators.

WHERE TO RUN THE INCUBATOR

As soon as you have uncrated your incubator, before setting it up, read carefully the manufacturer's directions—and then re-read them. This is the only way to start right and it is important. Learn what you have to do, and how to do it, then go ahead.

The first question to come up will be, where is the best place to run the incubator? As a rule, the answer will be that the house cellar, if free from gas and decaying vegetable matter, is the best place unless one has a specially constructed incubator cellar; but with a well made machine almost any unused room having a firm floor, free from excessive vibration, can be made to serve the purpose well. The best results will be secured in an unheated room where the temperature remains fairly uniform and where it does not run much above or below 65 degrees.

The question of ventilating the incubator room is not as important as is generally supposed, and so long as the air of the room is kept reasonably pure, good results will be obtained. A good deal has been written about the danger from carbonic acid gas, but the fact remains that the embryo chick is able to stand a considerable amount of this gas in the air around the eggs. Several recent experiments by experienced investigators tend to show that the presence of carbonic acid gas (carbon dioxide) in the hatching chamber, when accompanied by moisture, has a tendency to assist in the process of exclusion by its action on the egg shell. Apparently the gas weakens and partially dissolves the shell, making it easier for the chick to hatch. Experiments made at the Montana Experiment Station found nearly twice as much carbon dioxide under setting hens as was found in the egg chamber of the incubators used in the test;

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33—A SAFE AND CONVENIENT BROOD COOP

the hatches showing that the presence of the gas aided rather than hindered hatching. Ordinarily the incubator room will get sufficient ventilation in winter without keeping the window open. If a number of machines are run in the room it may be necessary to air it out once a day. In summer time a window should be kept open day and night for ventilation.

HAVE THE INCUBATOR LEVEL

Care must be taken to place the incubator so that it will not sit in a draft and it should be made as nearly level as possible. Use a spirit level on top of the incubator to test it from back to front and from side to side. If a level is not at hand use a shallow pan of water on top of the machine for the same purpose. If the water is the same depth on all sides with the bottom resting evenly on the top of the incubator the machine is level. Block up under the legs of the machine until you get it right. If the body of the incubator is not level, the egg chamber will not heat evenly; therefore be sure that the machine is as nearly level as possible. Be sure it sits firmly.

WARMING UP

When starting the incubator run with low lamp flame until the machine is thoroughly warmed through. Then run with a moderately high lamp flame and adjust the regulating device according to the manufacturer's directions. After securing the proper adjustment the machine should run evenly at a temperature of 102½ to 103 in the egg chamber with the center of the thermometer bulb two inches from the bottom of the egg tray. Maintain this temperature throughout the hatch. Run the incubator empty for a few days until you become familiar with it and are sure that the regulating device is working properly. After you are sure you understand the operation of the machine and can run it at an even temperature, the eggs may be put in. Do not put in the eggs until you can run the empty incubator at an even temperature.

SELECTING THE EGGS FOR HATCHING

Don't be eager to fill the machine to the fullest capacity of the egg trays. Select the eggs for hatching as carefully as you would for use under hens. Be sure the eggs used for hatching are from breeding stock that is in the best possible condition. Eggs from debilitated or unhealthy fowls will only prove a disappointment. If they hatch, the chicks will not do well and the probability is that many of the chicks will be dead in the shell or die within the first ten days after hatching. To get the best results use only eggs from sound, healthy breeding stock. Eggs of medium size for the fowl producing them usually hatch best. Very large or very small eggs should not be used. Discard all eggs having misshapen, rough, lumpy or thin porous shells.

Unless the egg tray is especially fitted for placing the eggs in rows there is no need of so arranging them. Fill the tray with as many as will go in easily, but do not pile up the eggs or attempt to double up by placing eggs on top of a full tray.

STARTING THE HATCH

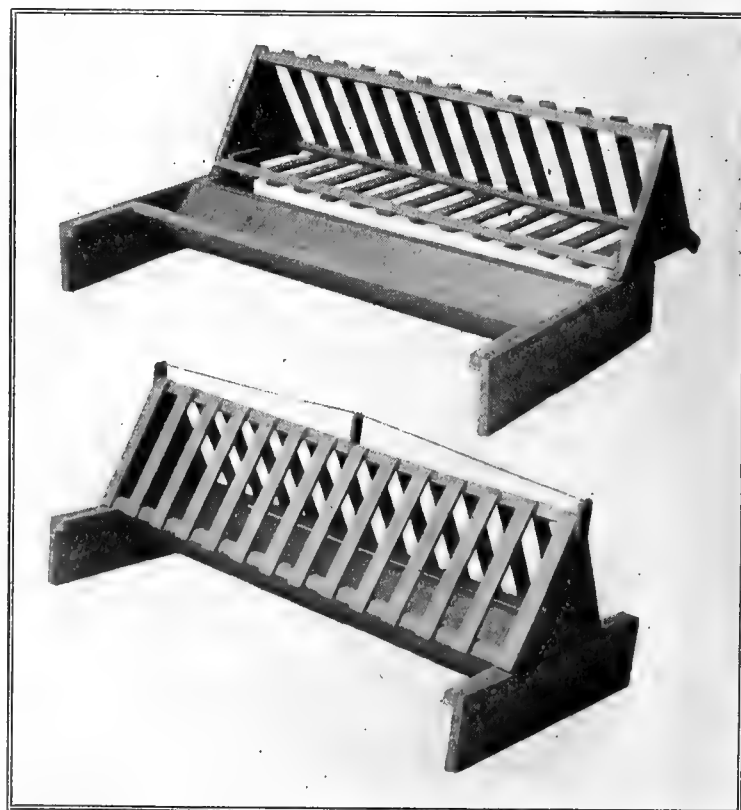
After placing the eggs in the machine, let it alone until the eggs have had time to warm up, which will take several hours. Then make sure that the machine is holding temperature properly and do not let the heat run above 103 degrees. Too high a temperature during the first week will injure the germs.

Under all ordinary conditions it will be best to run with the ventilators closed in hot air machines, having an exhaust or return pipe to the heater, and nearly closed in other types. Too much ventilation is worse than none. The modern machines of standard make furnish ample ventilation and it is seldom necessary to run the vents wide open. In case of doubt, consult the directions furnished by the manufacturer. He should know best the proper conditions for securing good results with his machine.

Run the incubator lamp with a moderately high flame at the start, gradually reducing the height of same as the hatch progresses, until you are running with the minimum height flame necessary at hatching time. This is necessary on account of the constantly increasing radiation of animal heat from the eggs as the embryo grows and becomes more vigorous.

TURNING THE EGGS

After the second day it will be necessary to turn the eggs twice a day; these turnings should be as nearly twelve hours apart as possible. The writer prefers to turn eggs by removing them from the center of the tray to the ends and rolling the balance inward toward the center with the flat of the hand. This is the most satisfactory method and is easy and simple in practice. It tends to even up any inequalities of temperature in the egg chamber and gives all the eggs an even chance to hatch well. In addition to this the position of the trays should be changed from side to side at the morning turning, when two or more are used, and turned from end to end at the night turning.



34—A MOST SATISFACTORY FEEDING TROUGH

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COOLING THE EGGS

Under all ordinary conditions in a temperate climate, except in extremely warm weather, the eggs will do better if no cooling or airing is attempted. The eggs get all the airing necessary, for best results, while being turned and should be returned at once to the incubator after turning. After the eggs are replaced the door of the egg chamber should be closed and the machine let alone until next turning time. The temperature of the eggs and the egg chamber always falls whenever the incubator door is opened or the eggs are removed for turning. Do not attempt to adjust the regulating device to assist the machine to return to normal temperature; if it is let alone it will recover the proper temperature in a short time without regulation.

In very hot weather, where the temperature runs high in the incubator cellar, the eggs may be cooled from five to fifteen minutes once a day. When running at any season of the year, should the temperature of the egg chamber rise above 103 degrees, from any cause, it is a good plan to cool the eggs from five to fifteen minutes according to the length of time they have been exposed to higher temperature. Do not practice cooling the eggs, except as advised herein if you wish to get the best results.

CARE OF THE LAMP

Keep the incubator lamp clean. Put in a new wick when starting each hatch. Be sure to trim the wick and fill the lamp after turning the eggs every morning. Never attend to the lamp and then handle the eggs with oily hands. Carelessness of that kind has ruined many hatches. Keep the perforations in the disc about the wick tube of the lamp burner, clean and open, and do not allow crusts to accumulate on the wick tube. Use only the best grade of kerosene oil.

In filling the lamp be careful not to run the oil over—have it full, but not too full. Always run a lamp flame of sufficient height so that it can be turned higher or lower as needed. Never turn the flame high enough to cause the lamp to smoke.

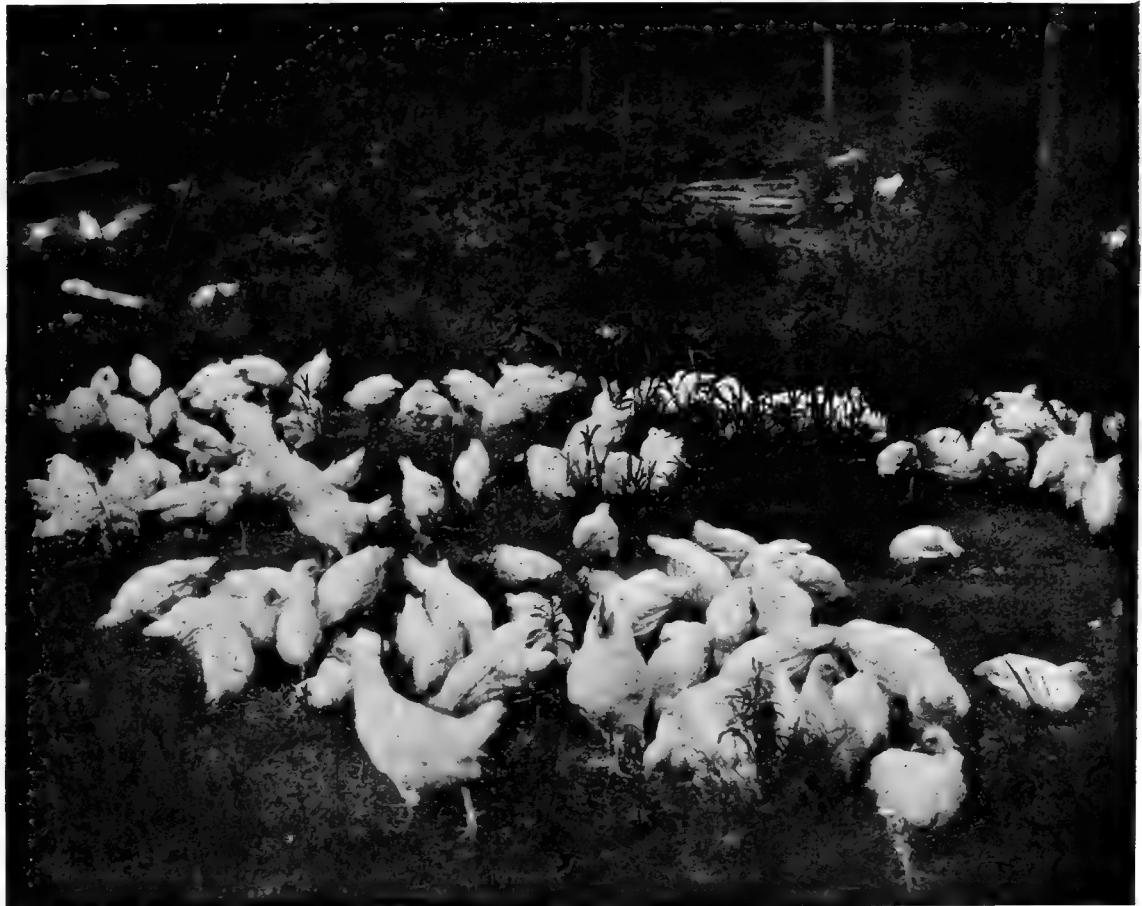
TESTING THE EGGS

An egg tester is furnished with every incubator and hen eggs should be tested twice during each hatch. Experienced operators will make their first test on the sixth day, but it is easier for the beginner to test on the tenth day. Do not turn the eggs on testing day, as handling them while testing will stir them up all that is necessary. In cold weather test the eggs in a warm room. When the egg tray is removed close the door of the machine. The egg tester should be ready for use in a dark room and it is more convenient to provide an extra tray in which to place the fertile eggs and a basket for the infertile ones and dead germs. By holding the eggs before the

opening in the egg tester, which has been placed on a lighted lamp, the operator will be able to examine the contents. The infertile eggs will be perfectly clear or only show a slight shadow of the yolk.

The dead germs are not so easy to recognize, and a little practice is necessary to identify them. Many dead germs will show a small irregular red line apparently adhering to the inside of the shell, or a broken circle of red containing a dark brown spot. The operator will soon become familiar with the various types of dead and putrid eggs.

On the sixth day the live egg is easily recognized as it contains a spider like arrangement of blood vessels in the midst of which appears the embryo, a small irregular dark body which has pulsating motion and appears to be floating in the center of the network of blood vessels which radiate from it. On the tenth day the larger portion of the fertile egg appears dark with a fair sized air space at the large end. Mark any doubt-



35—HEALTHY BROODER-RAISED LEGHORN CHICKS

ful eggs and let them remain in the machine until the next test. When the trayful has been tested and the infertile eggs and dead germs removed, the live eggs should be returned to the incubator. The infertile eggs may be cooked and fed to large brooder chicks, growing stock or breeding birds. Do not feed eggs to newly hatched chicks.

The second test should be made on the seventeenth or eighteenth day. All live germs will now appear to fill the greater part of the egg, making it opaque when held before the tester. The air cell will be considerably increased in size and may show a slightly irregular outline. Dead germs will show a streaky or mottled appearance. All dead germs and any eggs, marked doubtful at the first test, which have failed to develop should be removed at this time.

HATCHING TIME

When chicks begin to pip the eggs (break the shell) it is time to stop turning. The trays should be pushed back as far

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as they will go to give the chicks a chance to drop into the nursery below the trays, or, if there are two trays, one may be pushed back and the other drawn forward, leaving a space at the front and back of the egg chamber for the chicks to fall into the nursery.

Now close the machine and let it remain closed until the hatch is over. If it has been running evenly and regulating properly it is perfectly safe to trust and interference at hatching time will only injure or spoil the hatch.

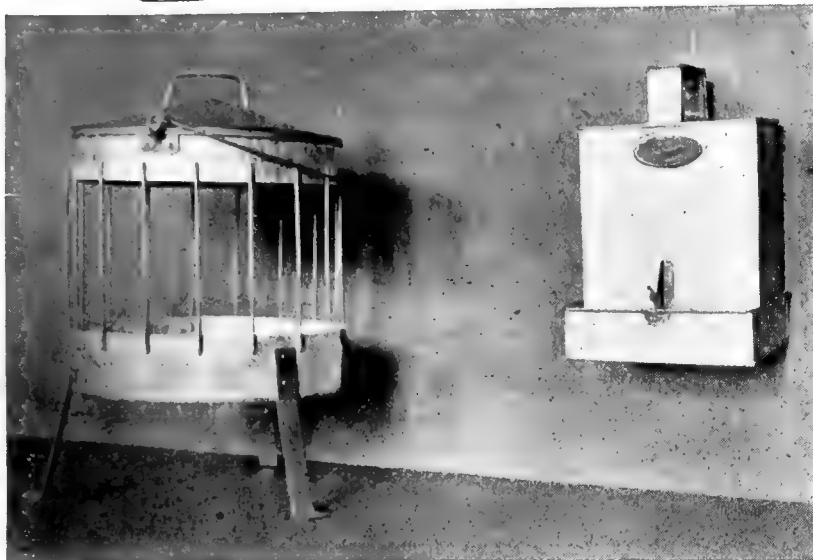
Learn to let the incubator alone at hatching time. When the chicks are hatching it will do so harm for the temperature to run as high as 105 degrees, but it should not go higher.

Never open the incubator to "help" a chick which seems

is a large number of very wet chicks in the machine, but as soon as the chicks have dried the trays should be removed.

By leaving the incubator door open in this manner a greater volume of fresh air is supplied for the use of the chicks which now require a considerable quantity for breathing purposes since their lungs have been brought into action. While the incubator has sufficient ventilation for all purposes of incubation, and for supplying sufficient oxygen to the embryo chick through the blood vessels lining the egg shell, it does not give a sufficient amount of fresh air for use of a machine full of lusty young chicks which have broken out of their shells and are making use of their full lung capacity for the first time.

Chicks hardened off in this manner always make a better life of it than when confined too closely to the machine. It will be advisable to let the chicks remain in the incubator for 24 to 36 hours after hatching, at the end of which time they should be placed in the



36—DRINKING FOUNTAIN AND FEED HOPPER

to be having a hard time to get out. Such practice is almost certain to injure the balance of the eggs by releasing the moisture and cooling the eggs. When the chicks have all hatched as near as you can judge by looking through the glass in the incubator door, the ventilators should be thrown wide open; at this time remove the egg trays and all egg shells from the machine, turn the buttons on incubator door to the perpendicular and close the door against them, fastening it in place by means of a wire attached to a tack driven into the body of the machine and make it fast to the knob on the incubator door. This leaves the door open a little and allows a greater volume of air to enter the egg chamber, assists the chicks to dry off properly and helps harden them at a temperature a little lower than that at which they were hatched. This should not be done if there

brooder which has been made ready and is running all heated up waiting for them.

WHAT IS A GOOD HATCH

Don't expect too much of your incubator. Many competent men believe that they get just as good or better results from the season's work with incubators as they could with hens. They have good ground for their belief.

Some hens will hatch thirteen chicks from thirteen eggs sometimes. Many more hatch but five or six chicks and there are plenty of hens that do not hatch any chicks at all or that spoil nearly all of their eggs.

You get chicks dead in the shell from various causes when hatching under hens and you get them in incubators. Summing

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it up carefully you will not find such a wide difference in results between the natural and artificial methods for the given number of eggs incubated. You don't feel alarmed if you find from four to five chicks dead in the eggs under a hen, yet the same percentage loss in a 100 or 200-egg incubator startles you, because it looks bigger, owing to the greater number that you see at one time.

Two infertile eggs and four chicks dead in the shell out of a sitting under a hen is a very common thing. In a machine containing one hundred eggs the same percentage would mean at least fifteen infertile eggs and thirty chicks dead in the shell, which would seem alarming to the inexperienced.

Experienced incubator operators feel well satisfied if they find that their entire season's work gives them an average of fifty chicks for each hundred eggs set. Some are able to better this average. Hatches made during the spring months, the natural breeding season, will frequently run a much higher percentage. I have obtained 75, 80, 97 and 108 chicks from the 120 eggs set when hatching in March, April and May and many others can report like results. Earlier and later hatches have given 50 to 65 chicks, sometimes more, very seldom less, while even some spring hatches have not averaged better than 50 per cent of the eggs set. I considered the results good and never once thought of blaming the incubator. Hens would not have done better with the same number of eggs, conditions being equal.

One hundred per cent hatches are sometimes made in incubators, but like the thirteen chicks from thirteen eggs that advocates of the natural method like to boast of as "old biddy's" record, they are exceptional cases.

Get a good incubator, use good fresh eggs from sound, healthy, vigorous breeding stock and be reasonable in your ex-

pectations. If you do this, take my word for it, you will not be disappointed.

An old time poultryman recently said to me, "I wouldn't set 500 eggs under hens again if you'd give me the eggs and pay me for my trouble. I'll take an incubator every time, keep my conscience clear and a clean sheet with the recording angel. I haven't the time nor the patience to hatch a lot of chicks with hens." I have no doubt that many feel as he does and I know that I do.

CARE OF THE INCUBATOR

After the chicks have been removed from the machine give it a thorough cleaning. If the incubator has burlap or other porous material covering the bottom of the nursery, this should be cleaned and removed. Run the machine for a day or two to thoroughly dry it out before starting a new hatch. When a number of hatches have been run it is advisable to use a weak solution of some creolin disinfectant in warm water to wash out the interior of the egg chamber. Before starting with another lot of eggs be sure to dry and air out the egg chamber thoroughly. Ordinarily disinfectants will only be required at the close of the hatching season before the incubator is put away.

Always store the machine in a dry place where the wood-work will not be liable to be affected by moisture and so swell and warp out of shape. Never leave an incubator with the lamp filled, if this is done the oil is liable to creep up on the metal and the result will be that when the machine is next started it will smoke and give trouble. A little attention given to taking care of the incubator when through hatching will prove a saving both in time and money and aid greatly in the preservation of the machine itself.

A FEW HINTS ON BUYING INCUBATORS

DO NOT PUT IT OFF—BUY A GOOD INCUBATOR—CONSIDER THE RIGHT SIZE—LOCATION OF THE INCUBATOR—THE ABUSE OF INCUBATORS—TEST THE EGGS

A. F. HUNTER



DO NOT put off buying too long, that is, until the season for hatching is near at hand. An incubator will cost no more bought early than at the time you want to begin to use it, and there are very manifest advantages in getting it into your possession, and becoming to a certain extent familiar with it.

While extreme delays may be unusual, still, there are possible delays, owing to the transfers which may be necessary in transit. Therefore we say buy your machine in good time so as to avoid the possible misfortune of delay. Another point is that you have an opportunity to set up the machine at a time when you have plenty of leisure to do it right and get the conditions right.

We heard from a lady in Montana who says that she bought an incubator last spring, got it home to her house about noon, went to work uncrating it and setting it up as soon as she had eaten her dinner, and at 5 o'clock in the afternoon put the eggs into it. A little consideration of the risks those eggs were subjected to will illustrate the point. She had never seen an incubator before and had no idea of running one excepting what she got in the directions sent with the incubator. As fortune favored her, she got a good hatch, but the chances were certainly very much against it; and it is very foolish to take chances when we can avoid them by taking time by the forelock. It is good, sound advice to take three or four days in which to

gradually warm up the machine to the desired temperature, see that the regulation is properly adjusted to the desired point, become familiar with the individuality of the lamp so that the flame can be set at pretty nearly the same point after each filling and trimming,—in fact, become "familiar" with the methods of operating the incubator. This is purely elementary advice, but the great bulk of incubator buyers are amateurs, and very many of them have never operated incubators before, hence these same "A, B, C" points have to be gone over frequently.

BUY A GOOD INCUBATOR

Do not make the mistake that some beginners do of buying a cheap incubator because you risk less in case you do not succeed with it. We had that argument made to us in a letter in which the writer said he preferred the—because it was cheapest, and if he did not succeed with it his loss would be smaller. We have no right to say that a cheap incubator is not a good incubator; nor to say the reverse, that the highest priced incubator is the best incubator. The point we wish to suggest is the one which the late President Harrison made in his oft-quoted statement about the cheap coat. It is a well known fact that a cheap pair of shoes cannot be made of so good leather nor so well made as a pair of shoes costing, say, twice as much; no one would expect to get as good a pair of shoes for \$1.50 as he would for \$3; in the very nature of things it is impossible that he should.

ARTIFICIAL INCUBATING AND BROODING

As this principle runs throughout all business, it is perfectly legitimate advice to say that the probability is against a cheap incubator being as good an incubator as you will require for best results. Be sure you buy a good one, because the incubator is the chief corner-stone of your success in poultry work. Chickens that are poorly hatched start in life with a serious handicap and in the very nature of things cannot be so thrifty, cannot grow so well, and have not so much strength and vigor as chicks that are "well hatched." A well known physical scientist says that "we owe to our children that they be well born"; similarly we owe it to our chickens that they are well hatched. There is another adage that applies, namely, that "well begun is half done"—hence the importance of the advice to buy a good incubator.

CONSIDER THE BEST SIZE

A very common mistake with beginners is to buy a small machine, and then, after a hatch or two, learn that they ought to have had one of twice the size. A case in point was that of a lady in Canada whom I met last summer. She bought a small incubator, took it home, set it up, got an excellent hatch from it, then went directly off to the agent and exchanged it for a 100 per cent larger size, because she wanted one that would do twice the work of the smaller one. She had bought a small one in the first place because she distrusted her ability to run an incubator, and was not certain that an incubator would do as good work as hens; but that brief trial convinced her that she had blundered in buying the small size and that it would have been sundry dollars in her pocket if she had bought the larger one at the outset. Fortunately, in her case, the mistake was comparatively easily remedied, because the agent was only eight or ten miles distant and was quite willing to make the exchange with her. If she had bought the machine of the manufacturer direct there would have been the difficulty of arranging the matter by correspondence, taking down, crating and shipping the machine back and remitting the difference in price, and paying return freight charges on the larger machine.

Consider well the hatching capacity you require for your business and buy a good incubator of the size that will do the work you wish to have done. The time has gone by when there is any question about an incubator doing the work an incubator is wanted to do. It has been abundantly proven that a good, dependable incubator will not only hatch chickens, but will hatch those that are strong and thrifty; the incubator will do better work than will the erratic sitting hens. This point of buying a good incubator is suggested by the experience of a lady who mentioned incidentally that she bought an incubator last spring and sold the chicks of the first hatch for enough to pay for the machine and had some \$5 over; as she had never used an incubator before, such an experi-

ence is abundant proof of the good work incubators will do.

LOCATION OF AN INCUBATOR

The location of the incubator is a most important question, for upon its right location much depends; as, for example, its accessibility and hence ease of management, the supply of fresh air for it, and many other aids to good hatches. Taking up the question of fresh air first, because it is very important—it is really wonderful that some incubator managers get as good results as they do. The common advice is, "Put the incubator in a cellar," without a thought of how many different shades of meaning are attached to that word, cellar. In some sections of the country there are no such things as cellars, in other sections, as for example, New England, a cellar is a large or small underground apartment intended for the storage of fruit and vegetables to secure them against frost (not forgetting a row of barrels of cider), and such a cellar has usually no facilities for ventilation; and, during the winter months, absolutely

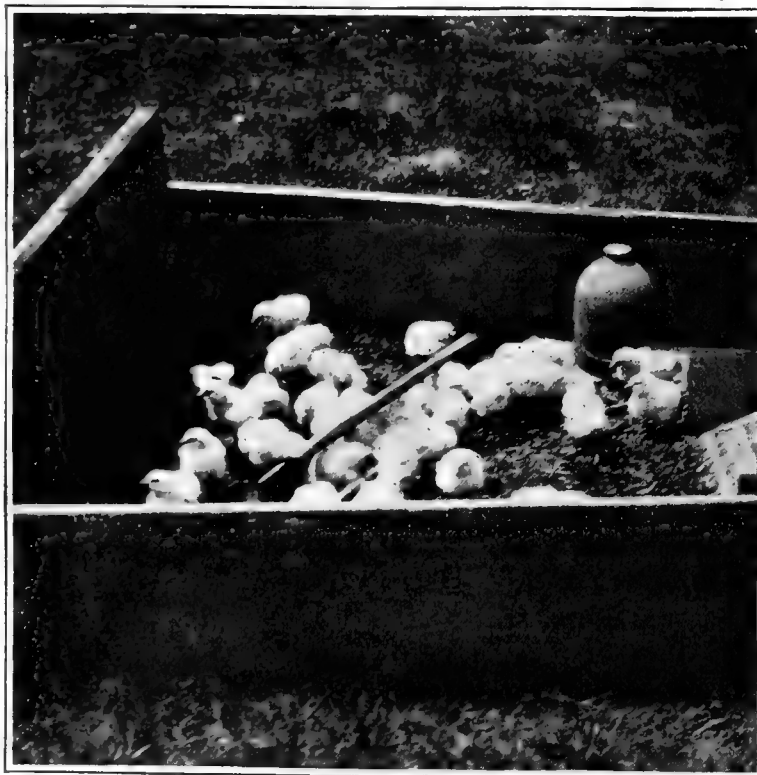
no fresh air reaches it save such as is admitted when the housewife goes down to get supplies. Such a "cellar" is a most unfit place for an incubator because the incubator lamp, burning night and day, soon exhausts the oxygen of the air, and by the time the germs have developed into embryos and begun to breathe, there is practically no oxygen for them. Oxygen is absolutely essential to life, and a liberal supply of oxygen is needed by the one or two hundred tiny pairs of lungs within the incubator if the bodies are to develop strength to survive the struggle for exclusion. Here is where very many beginners stumble. They are afraid to allow fresh air to enter for fear of variations in the temperature of the incubating apartment, or that the slightest current of air, will derange the regulation of the machine, and the direct result of their fear is insuffi-

cient oxygen, weakened embryos and a poor hatch; furthermore, even the chicks that have sufficient strength to survive to exclusion are to a considerable per cent, debilitated and weaker than they would have been if there had been a sufficiency of fresh air.

For many reasons the common house cellar is an unfit place in which to run an incubator; most cellars are too damp and all are lacking in facilities for admitting fresh air, hence it is much wiser to have the incubator room above (or mostly above) ground.

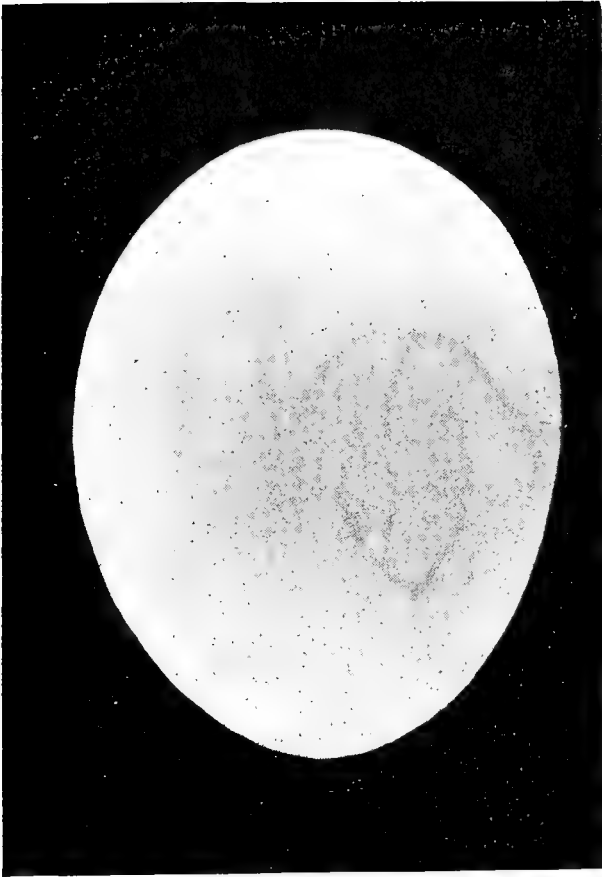
THE ABUSE OF INCUBATORS

Many people are unfair to their incubators, either through ignorance or carelessness, or both, and do not give them more than half a chance to do the work an incubator is intended to do. An incubator is precisely like every other kind of machine in that it has to be operated by "human intelligence," and if the operator neglects to apply his intelligence and commonsense, or has a super-abundance of that impalpable quality

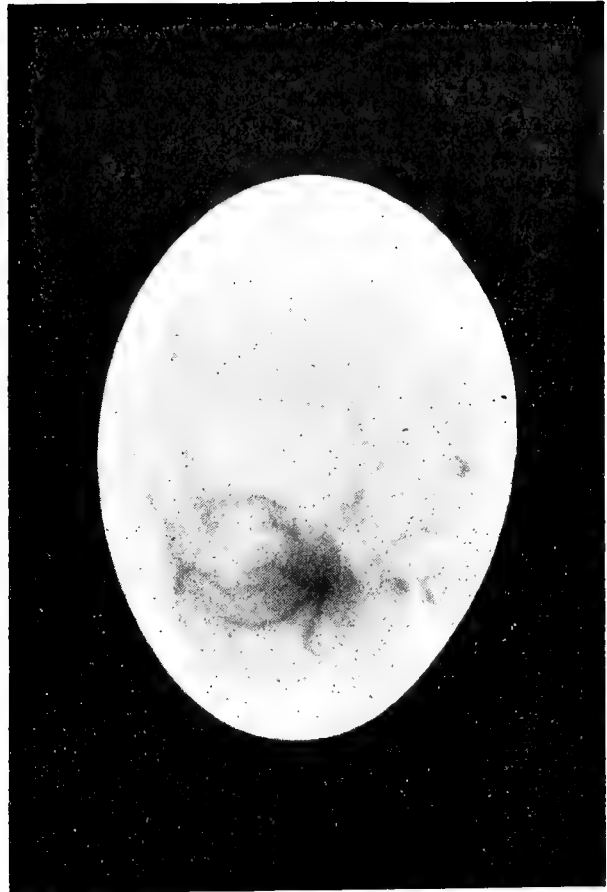


37—A CONFINED PEN IN FRONT OF THE BROODER

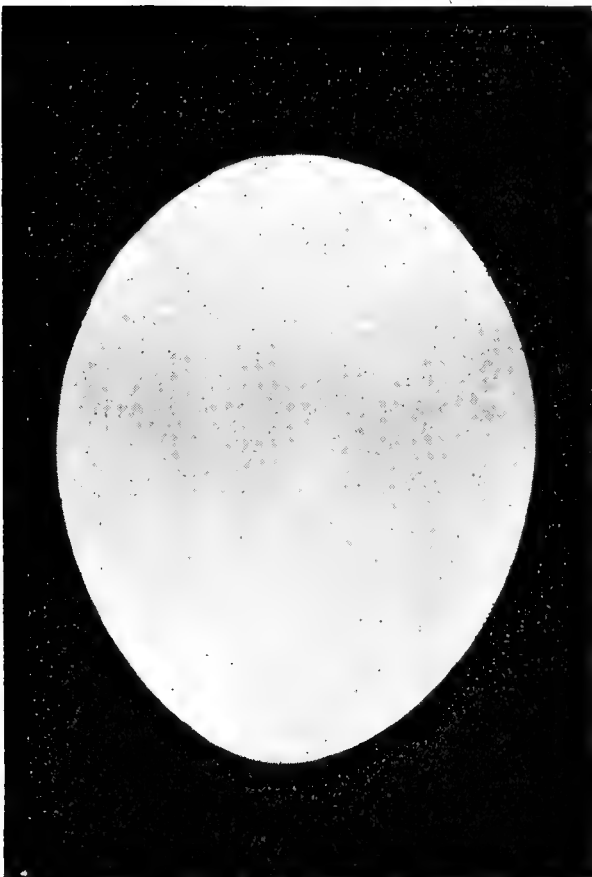
This illustration shows a method of confining chicks that should not be practiced in warm weather. The pens should have wire or lath sides to allow of a free circulation of air.



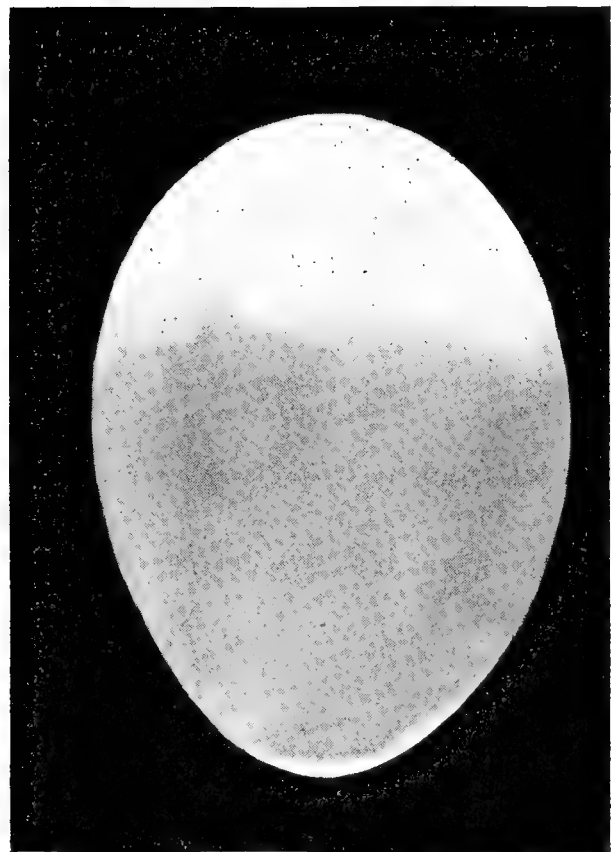
FERTILE EGG (HEN); SEVEN DAYS



FERTILE EGG (DUCK); SEVEN DAYS



INFERTILE EGG (HEN); FOURTEEN DAYS



FERTILE EGG (HEN); FOURTEEN DAYS

HOW EGGS APPEAR THROUGH A TESTER AT VARIOUS STAGES OF INCUBATION

ARTIFICIAL INCUBATION

which New England people call carelessness, the results will be unsatisfactory and the incubator manufacturer will get the blame. An incubator is not endowed with intelligence. That most essential quality must be supplied by the operator, and that word "intelligence" is very significant. Possibly the term common-sense or "horse-sense" explains it better, because it is not essential that a man or woman be a trained scholar, but it is necessary that one be able to understand the plain directions, and then follow them.

One difficulty is that the instructions have such a different meaning to different individuals, because they understand words differently. Take, for example, the instruction to fill and trim the lamp once a day. To a careful and tidy housewife that means that the lamp is to be filled pretty well up to the top, the charred crust of the wick brushed off, the burner carefully wiped and the perforated air plate in the base of the burner is to be brushed clean and then wiped clean and dry, and then the lamp itself is wiped clean of any dust collections and, in fact, of all dirt and dampness, whether of oil or moisture. To the "careless" individual the same instructions to fill and trim the lamp mean that the can of oil is up-ended, slap-dash, and oil spurted into the lamp until it is overful, then the thumbnail (or a match-stick) is run along the edge of the wick tube to scrape off the incrustated wick, the scrapings falling over the burner and especially upon the air-plate in the base, the lamp is relighted, chucked back into place and left to its fate. This isn't a "fancy sketch"—we have seen incubator lamps mishandled in just that way, and the man was called a "hustler" and had the name of "turning off a whole lot of work." Evidently the work was "turned off!"

We don't at all mean that there is to be a lot of "fussing" with the lamp and other details of caring for an incubator, because there is not. It is a fact, though, that a very great difference in mental habit means a very great difference of interpretation (or understanding) of instructions by different persons, and while one will easily and successfully manage his incubators and get good hatches another will so bungle his work as to get poor hatches every time, and he will be the one to complain that incubators are no good, or that he hasn't luck with them.

NO SUCH THING AS "LUCK"

There is no such thing as luck with an incubator. There is some element of "luck" in hatching with hens, but with a well made and well regulated incubator the element of "luck" isn't in it at all. If instructions are followed and the regulator rightly adjusted the temperature is held to a degree, and with the temperature kept at the desirable point and the ventilation what it should be the eggs will hatch if handled right. If the regulator doesn't control the temperature the machine is at fault, because the up-to-date incubators of to-day will keep the temperature right; if you haven't an incubator with a regulator that regulates you haven't the right incubator!

We should remember that the incubator manufacturer wants us to have good hatches; it is to his interest to have us succeed, as an unsuccessful customer is a poor advertisement for his machine. The instructions sent out with it are calculated to aid to a successful operating of the incubator, but we must do our part and supply the element of intelligence and common sense. If anyone buys an incubator in the expectation that all he has to do is put in the eggs and then take out the chicks at the end of three weeks he will get badly left. The house-wife knows a kitchen range is a tool or implement for accomplishing certain results with foods for the family, and she also knows that she must guide the range in its work, regulating the heat to the particular work she desires to do, putting in and taking out the loaves of bread at the right time., etc. Just so with the incubator. It is an implement with which we can accomplish the hatching of chickens at any time we choose if we do our part,

just as the house-wife accomplishes a successful baking by doing her part; the essential thing is that we "do well our part."

As we said before we don't want to be continually "fussing" with the incubator; leave it alone and give it a chance to do its part! Many a fair promise has been wrecked by injudicious meddling on the part of the operator, and if we can get amateurs to understand that they are doing the best service by letting the incubator entirely alone, excepting the regular trimming and filling of the lamp and turning and airing of the eggs, we shall have decidedly aided to good results. Of course, the thermometers must be glanced at night and morning to be sure the temperature is steady, and the air in the incubator room must be fresh and pure, but, beyond that, the less the incubator is fussed with the better. Judgment must be used, also, in cooling and airing the eggs, and especially must we be careful if the incubator room is cold. In winter it is good economy to warm the incubator room to (say) sixty degrees, so as to avoid the severe shock to the embryos of taking the eggs out of the warm incubator into a temperature well down towards freezing. Embryo chicks are decidedly more delicate in winter than in April and May, and it is in winter they are liable to be subjected to a particularly trying low temperature; the spring eggs are decidedly stronger and more hatchable, and yet the winter eggs are the ones likely to meet the extra trying conditions. We must use judgment in all of the details of incubator management, as do the incubator operators who have made the splendid successes. "Don't care" never made a success of this (or any other) work!

TEST THE EGGS

A not uncommon fault of inexperienced incubator operators is to neglect testing the eggs. This is a mistake for several reasons. First, there is always a proportion of eggs that are absolutely clear, running usually from 10 to 25 or 30 per cent, and those clear eggs are perfectly good for cooking. They are not quite fresh, of course, since the six or seven days that they have been in the machine have "staled" them to a certain extent, but no more than if they had lain on the counter of a country store for a few weeks—as is very frequently the case. Large operators usually sell these infertile eggs to bakers and confectioners, and they are used up in making cakes, pies, custards, etc.

A decided advantage in removing from the trays these clear eggs is that there is more room for the fertile eggs in the trays, and they can be turned and handled more easily; even if no second test is made, a first test, to take out the clear eggs, certainly should be made.

A second test about the sixteenth or seventeenth day, to remove germs that have died since the first test, is a help to a good hatch. Those dead eggs usually throw off slight odors or deleterious matter, hence a good hatch is promoted by getting them out of the machine. Another argument for testing eggs is that it increases one's knowledge of embryonic life and development, and enhances the interest of artificial incubation. A good tester is sent out with every incubator sold and we strongly urge the buyer to start right,—and learning to test his eggs is an important part of that start.

Dark shelled and thick shelled eggs are more difficult for an amateur to test than are the more common white-shelled eggs, for the reason that the light does not shine through them so well, and even an experienced tester may mistake a clear egg for a probable germ; that is, the yolk may throw a shadow that will have the appearance of a good, strong germ.

It is well in learning to test to break a few eggs that one is doubtful of and learn the appearance of clear eggs, dead germs, strong-living germs, etc. Do not be afraid to sacrifice a dozen or two of eggs in the interest of gaining knowledge—it is a good investment in the long run.

ARTIFICIAL INCUBATION

SUPPLY FRESH AIR

Be sure that there is an abundant supply of fresh air in the incubator room at all times. A serious mistake of beginners is being afraid that a little fresh air will jeopardize the hatch. It is important to remember that if you have 150 living germs in an incubator all of those 150 living organisms are consuming oxygen every day and every minute of the day, hence it is important that they be abundantly supplied with that life-giving element. If the incubator is in a moderately warm place, say about 60 degrees, more air can be admitted to the machine and the eggs can be cooled and aired a longer time than if the machine is in a considerably colder place. This means that cooling and airing the eggs should be much less in cold weather than in mild, spring weather; then, too, you can do decidedly more cooling and airing the last third of the hatch than earlier, and the living embryos will be the better for it. The practice of operators varies considerably, some cooling and airing the eggs a great deal after the first week, and there are some who cool and air from the very start almost. Generally speaking, however, if

of fresh air getting to the chicks, and when the operator finds a lot of "chicks dead in the shells" he writes off to his poultry editor and complains that the incubator don't hatch good strong chicks! How could it, when the operator is afraid to let the life-giving oxygen in the air get to the embryo chicks, and doesn't give them a chance to grow strong and vigorous?

ARTIFICIAL HATCHING OF CHICKS

PRACTICAL INFORMATION IN REGARD TO INCUBATOR MANAGEMENT—FEEDING OF YOUNG CHICKS—MOISTURE IN INCUBATORS

H. P. JOHNSON

THIS is the modern method of raising chickens in any numbers, and the poultryman who tries to do it in any other way cannot hope to compete with those who adopt up-to-date methods. There are so many good makes of incubators on the market that it is

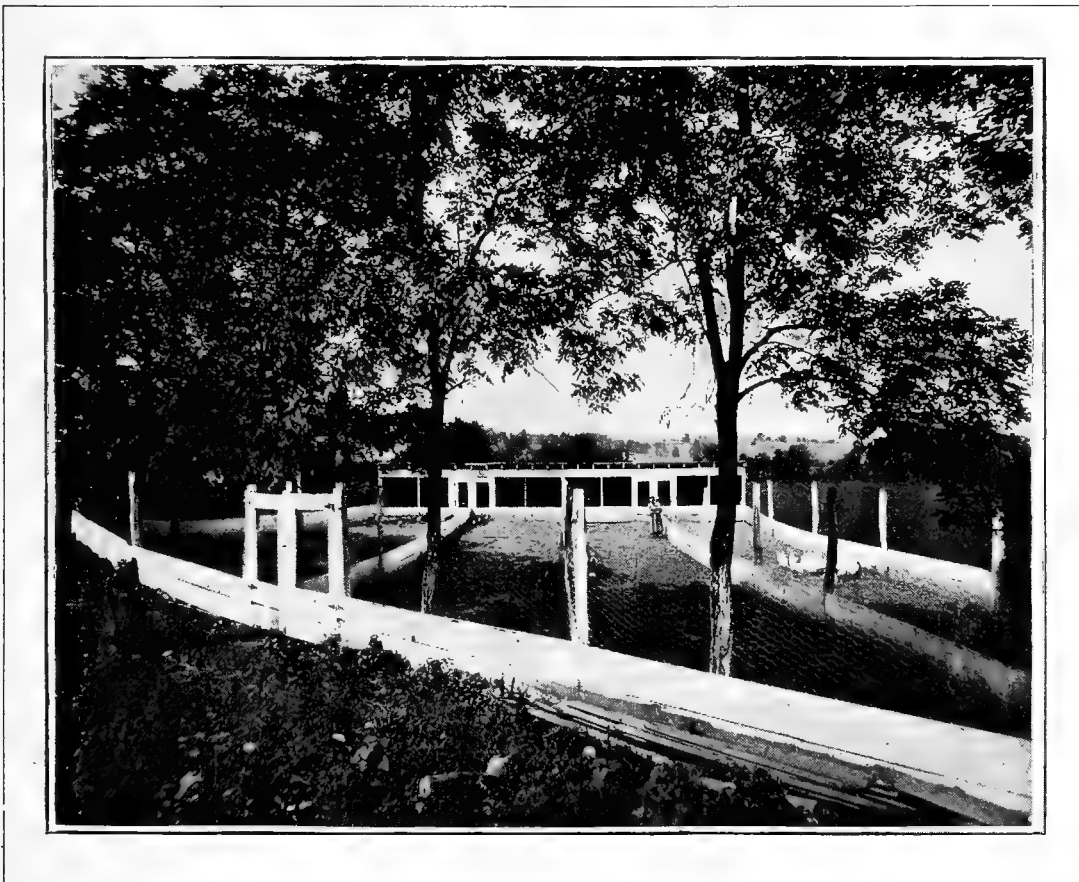
a hard matter to make any recommendation at all. Do not buy an incubator simply because it is cheap; rather buy the machine that costs a little more and that carries the maker's guarantee with it, and one that you know is in satisfactory use by the leading poultry raisers of the day. The same remarks will apply to the brooder, for whereas anything will hatch a certain percentage of chicks, it is only the properly constructed, scientifically ventilated brooder that will raise those chicks after they are hatched.

There are, from my experience, a few golden rules that must be observed by those who would have success in the operating of incubators, and they are as follows: Run the machine strictly in accordance with the maker's printed instructions; for it is a reasonable supposition that he has made every experiment and investigation necessary for success and is as much interested in the machine doing the work

properly as you are, and more so, as it means increased sales for him; therefore, I say, follow his directions to the letter.

Air your eggs at a regular time every day and also have a set time for filling and trimming your lamp, and do it then, so that you will not have the misfortune to find your machine cold and the hatch ruined.

Do not be in a hurry to open the machine at the end of the hatch; your chicks will not die of starvation; nature has provided for all their requirements for at least forty-eight hours after exclusion, and more chicks are killed by opening the machine, perhaps with a view to saving some chick which it is thought cannot get out by itself, than by any other means. The chick that has to be assisted out of the shell is never any good, and in saving, or trying to save, the one you may kill fifty others. Let me then make a strong point of this; do not allow any one, by any excuse, whatever, to open your machine during the



38—IDEAL QUARTERS FOR BREEDING STOCK

the incubator is in a cool place it will be found that the eggs get sufficiently cooled and aired at the daily turning the first week, then a few minutes a day the second week, and the last week (up to the time of pipping) ten to fifteen minutes a day is none too much. Indeed, if the animal heat in the eggs is strong and the temperature of the incubator room is 60 degrees or above, quite a long airing daily will be beneficial.

Don't be afraid of giving the embryo chicks shut up within the egg shells too much fresh air to breathe,—the errors are all in the other direction. One man, for example, stuffed rags into every crack and crevice, to keep out the life giving oxygen in the air! He will save a few cents worth of oil by keeping out the cool air, but at the expense of vitality and vigor of the chicks,—and some of them may be so weakened by the lack of fresh air to breathe that they may not be able to struggle out of the shells. Many and many a hatch has been spoiled by this fear

ARTIFICIAL INCUBATING AND BROODING

hatching or until it is all over and you are ready then to remove the chicks to the brooder. This is also a critical time, as they must be quickly removed to the brooder without a chance of a chill, which is almost sure to be fatal, and if not so will give them a great set-back, and they never will quite recover from it.

A most important point to be observed is the keeping of an equal temperature and the proper supply of pure, fresh air. In the matter of temperature it is a good plan to err on the side of too much than too little. What I mean is that if your machine is such that it cannot be regulated to a fine point, it is better to be on the high side than to have the machine at 102 degrees. One hundred and three degrees is conceded to be the correct incubating temperature, and the nearer the temperature is kept at that the more satisfactory the result.

All good makes of incubators are now provided with reliable automatic regulators, so that if the maker's directions are followed there will be no variations of temperature. Follow the directions and keep heat as regular as possible, providing plenty of fresh air by proper airing of the eggs daily. Do not be afraid to give the eggs plenty of fresh air, as this is essential above all



39—JUST HATCHED

things to the proper and timely exclusion of the chick and to the natural drying out of the egg. But do not get the eggs where they will be chilled or you will err on the other side. What is wanted is pure, not cold air.

Most beginners are too timid about airing the eggs; especially during the last week, and more chicks are lost from this cause than any other; they are practically smothered in the shell. Did you ever notice the way a hen will leave her eggs, often for half an hour each day, and even an hour if the weather is warm, and then hatch every one? More pure air should be the motto of the incubator operators and there would be more chicks. These same remarks apply also to the brooder and brooder houses. Fresh air is the life of the chick, both before and after hatching.

MOISTURE AND VENTILATION IN INCUBATORS

All know that varying conditions demand varying forms of treatment. This applies to artificial incubation, and especially to "moisture" and "ventilation." Experience has taught us that it is impracticable to build an incubator with a positive fixed ventilation (self-ventilation); also, with no provision for supplying moisture; for a machine must be so made as to give uniformly large hatches whether operated in a cold cellar or in an over-heated chamber, and whether operated under the exacting conditions in the dry atmosphere of Colorado, the damp air of the Atlantic coast, the heat of Florida, or the chilly air of Maine. Not to provide for these varied conditions would be impractical and unreasonable. Provision must, therefore, be made to govern at all times, in nature's way, the proper supply of fresh air and the lack or excess of moisture, under any and all conditions of atmosphere and temperature, and at different seasons of the year.

The operator will have to use a great deal of judgment and

common sense in this important matter, as the conditions at the time of hatching have so much influence on the matter that it is impossible to lay down any set rules.

There are times when the so-called non-moisture machines have been proved to give infinitely better results by having a pan of water placed in the machine.

HATCHING WITH INCUBATORS

W. H. HARDIN

IN REGARD to the kind of incubator to purchase, I should by all means advise buying a hot air machine in preference to a hot water one. Hot water may be just as good, but I have invariably had the best results from the former. My first choice for the location of an incubator would be a medium dry cellar, there being few changes of temperature in such a place, though I have had excellent results from machines that stood in my bed room. You should avoid placing your machines where a direct current of air will strike them, in which event you will find more or less trouble in maintaining a uniform degree of heat within the egg chamber, especially if your machine is a single case one. Although double case machines cost a fraction more than single case ones, yet they are well worth the difference in price and give far more satisfactory results.

In order that you may get a good uniform hatch, it is necessary that your eggs be as freshly gathered as possible, and as nearly as practicable of the same age. Freshly gathered eggs always will hatch sooner than those that are older. After getting your machine heated to the proper degree of temperature, introduce your eggs, allowing them to remain quietly for two days and nights, after which they should be turned night and morning and aired ten to thirty minutes, according to the season of the year. Do not let them cool much under seventy degrees. The importance of this matter of airing was brought to my attention before I began using incubators, from the fact that those of my sitters that came off their nests twice or three times a day during the period of incubation almost without exception brought off the greatest number of chicks, while on the other hand, the close, steady sitters never gave me satisfactory hatches. During the winter and early spring I should advise say ten minutes cooling; but later on, from twenty-five to thirty and even forty minutes would be better.

I test my eggs on the seventh day of incubation, removing all clear eggs, and I test from that time on until I am satisfied that none but fertile eggs, those that will hatch, remain in the machine, because if one or more chicks should die in the shell during the time they are allowed to remain in the machine they will throw off a most disagreeable odor which will prove disastrous to your hatch. It is highly important that the air within the egg chamber be perfectly sweet and pure at all times.

In regard to the proper amount of ventilation requisite at different stages of the hatch, I would suggest that an amateur on making his first hatch with an incubator set a hen at the same time he does his machine and note carefully from day to day the difference in the development of the air cells of the eggs under the hens and those in the incubator. By this means you can readily determine whether you have too much or too little ventilation.

If your machine is located in a cellar that is somewhat damp, it is not likely that you will need any supplied moisture, but in running your machine in a dry room above the ground, particularly in hot, dry weather, is it often necessary to supply a little moisture during the latter part of the hatch. However, the necessity for this will have to be determined more or less by the appearance of the egg shell. When the chicks come out, if they look dry and shriveled and pieces of the shell adhere to them,

ARTIFICIAL INCUBATION

add a little moisture by means of a wet sponge or a small quantity of warm water in a saucer, which will generally correct the trouble. Avoid opening the machine while a hatch is in progress, as it completely destroys the humidity of the egg chamber and will cause a loss of many chicks.

All the chicks should be out on the twenty-first day. When I am satisfied that the hatch is finished, I remove the egg tray, allowing the chicks to remain in the incubator until they are at least twenty-four hours old.

SUCCESS WITH INCUBATORS

INCUBATING AND BROODING EQUALLY IMPORTANT—HATCHING AND RAISING CHICKS

WILLIAMS BROS.

THE disappointment to beginners in the poultry business could, nine-tenths of them, be avoided if they would assume a less experimental strain, and adopt the horse-sense principle. Experiments are all right and to be commended when confined to the proper sphere, but it seems that most people when starting to operate an incubator for the first time believe they can improve upon the rules laid down by the makers of the machine. They, therefore, put their own ideas in operation, often ideas which are diametrically opposed to the rules given them, as well as being in opposition to the laws of nature.

All incubators are not operated alike, and while there is more or less similarity among them, in many cases the rules governing the operation of one make would not prove successful if applied to another. It seems natural that the maker of an incubator should understand his particular machine better than a person not so familiar with its mechanism, therefore, we strongly recommend to the beginner when starting his incubator to apply the rules laid down and given him by the manufacturer of the particular machine he is operating. After he has run it for two or three hatches, should he find he can improve upon the printed instructions he has followed, then he may do so, but he should by all means use all the good judgment he possesses, and mingle with it just as little "theory" as possible.

It is a very simple thing to operate an incubator. In recent years wonderful improvements have been made in incubator construction, until to-day there are machines on the market which are almost perfect. We believe that the best are none too good, therefore, would advise purchasers of incubators not to consider a few dollars' difference in cost, but to pay a little extra if necessary and get a good machine.

There are a few points we will refer to particularly as they may be beneficial to some who are inexperienced in operating incubators:

First. It is highly important to keep the temperature of the egg chamber as near 103 degrees Fahrenheit as possible the first week of the hatch, but do not lose your equilibrium should you find on different occasions that it varies. Sometimes the temperature drops to 95, without injury to the eggs. Again, it may go up to 107 the latter part of the hatch without serious injury, but this is risky business, although some of the best hatches we have ever seen have been under just such circumstances. There is nothing gained by such a variation of temperature, but on the other hand, everything to lose, however, we repeat, do not get excited if the temperature varies, but do your best to learn to manage your incubator so it will not vary.

Second. The moisture question is about as important as any, and should be carefully considered. It is difficult to make a rule which will apply to all machines and to all climates. In a dry climate, and in warm weather more moisture is required

than otherwise, and two or three hatches will prove to the operator whether the eggs require considerable moisture, very little, or none at all. If the chicks develop too rapidly it is usually caused by too much moisture, in some cases combined with too much heat. This causes them to die in the shell. It is far better to have a little moisture in the incubator from the beginning to the end of a hatch, rather than to put it in at intervals and have too much. Rather than guess at the amount required, we would much prefer to have a little in the machine during the entire hatch, i. e., from the first day to the twenty-first. But whatever you do, follow the instructions of the manufacturer.

BOWEL TROUBLE

Usually the cause of chicks dying the first week of their lives may be attributed to improper incubation of the eggs, resulting in their coming out of the shells not so strong in constitution as they should be. By "improper incubation" we mean too much or too little heat, or too much or too little moisture. If the chicks do not come out of the shells strong and vigorous, the operator of the incubator should be a close enough observer to determine the cause. He can do this by watching the chicks develop and studying the process of which so much has been written.

There is no more excuse for improper brooding and feeding than there is for improper incubating. While there are many first-class makes of brooders on the market, I think there is yet room for improvement in some. Poor ventilation of the brooders is the very root of all evil. It is the cause for chicks dying more than all other causes combined. A brooder which will give enough heat and still furnish an abundance of pure fresh air is the right thing, but a brooder which will cause the chicks to crowd and suffocate is not a success.

The key-note for feeding should be—"Keep the chicks hungry." Learn to feed them just what they will eat up clean, no more. Then feed again soon. Keep them busy and hungry. Never allow them to become overthirsty, but keep good, clean water before them all the time. Never feed sloppy food. We believe chicks will grow faster and do better on a dry, well-balanced diet, than on anything else. Never neglect the chicks from the time they are hatched. Any extra attention that can be given them out of the ordinary routine of feeding, etc., for the first three or four weeks is time well spent, for if they are given a good start, they will grow, and develop rapidly, whereas if they do not grow from the time they are hatched they never will reach the state of perfection they would had they started out on their career under more favorable conditions.

Cleanliness in everything connected with the chicks plays an important part, and this department must not be neglected.

Out here in California we can hatch and raise poultry any month in the year, although most of the extensive breeders count on getting out the largest number of chicks in January, February and March. It makes it very convenient for us in breeding and hatching for exhibition specimens, for we know just when to hatch the birds in order to have them just right and in the pink of condition for the different shows. We ourselves raise exhibition S. C. Brown Leghorns exclusively, and for the state fairs hatch out our birds about April 1st, and by September 15th they are in fine condition. Then for the December and January shows we hatch a little later. Eastern breeders must follow the seasons for doing their hatching, while California breeders do not have climate to contend with.

In conclusion, to get back to the subject of this article, we will say that there are only a few cardinal points to keep in mind to be successful, and any person of ordinary intelligence can raise poultry artificially if he will only apply himself to the business and study the requirements, always keeping foremost in mind—"Take every man's counsel, but reserve judgment;" then profit and pleasure will go hand in hand.

THE ADVANTAGES OF INCUBATORS

THE SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION GIVES RELIABLE ADVICE AND TELLS HOW SUCCESS MAY BE SECURED—THE ADVANTAGES OF POSSESSING AN INCUBATOR—WHERE IT SHOULD BE LOCATED—MUCH DEPENDS UPON THE EGGS—ATTENTION TO INCUBATOR AND EGGS—RAISING THE CHICKS

O. M. WATSON



AN INCUBATOR is necessary for chicks to be hatched early in the season. By having early hatched chicks much better prices are obtained, and the chicks mature earlier in the fall and commence laying before winter sets in, and if properly cared for a larger number of winter eggs can be obtained. By using an incubator hens can be stopped from sitting and can commence laying again.

A much larger number of chickens can be raised on a small lot. An incubator is a time saver. It requires fourteen to sixteen large hens to cover 200 eggs, and to look after these hens properly will require three times as much time as a 200-egg incubator will require. It will take eight gallons of oil to the hatch with a 200-egg incubator, which, at 15 cents per gallon, will amount to \$1.20. It will take half a pint of corn per day to properly feed a sitting hen. For sixteen hens, four quarts per day would be required. Four quarts per day for twenty-one days would amount to eighty-four quarts. With corn at 64 cents per bushel (two cents per quart), the cost of feeding sixteen hens for twenty-one days would amount to \$1.68. It costs less to heat the incubator than to feed the hens. By having the incubator thoroughly disinfected before the eggs are put in we avoid the worry and trouble of lice and mites.

WHY MANY PEOPLE FAIL WITH INCUBATORS

A great many people have an idea that all that is necessary is to get an incubator, put the eggs in, heat it up and let it alone. The advertisements of manufacturers of incubators are somewhat responsible for this. A certain amount of attention at the proper time is absolutely necessary.

A man will become interested in an incubator and will buy one. When it comes his hens are not laying much. He wants to start it up at once, so he goes out to get the required number of eggs. He gets all he can from his friends and gets the balance from the store, no matter what sort of weather they have been through nor how long they have been kept, no matter what sort of hens laid them nor what sort of care the hens had. All he is looking for is eggs. He puts his incubator anywhere, where it will be out of the way and starts it up. He hatches about ten per cent of sickly chicks, and then says that the incubator is worthless and throws it into a shed and gives it up.

THE PLACE TO RUN AN INCUBATOR

The proper place to run an incubator is in a room or cellar

where the temperature is not variable. The greatest trouble with a cellar is too much moisture. No matter if the temperature in the room is high or low, so it is not subjected to sudden changes. A brick cellar where it is not too moist is the best place. By having a story above, the room is not affected by the heat from the sun and the thick brick walls do not cool off as quickly when it is very cold outside. A great deal of trouble can be avoided by having the incubator in a room of this sort. The room should be well ventilated so as to have a constant circulation of pure air. Do not run the incubator in a draught.

THE KIND OF EGGS TO HAVE

A great deal depends upon the kind of eggs you have to put in an incubator (or under a hen). The eggs should be fresh and from good healthy, vigorous stock. As the eggs are gathered day by day they should be kept where they will not get too cold or too warm. Select eggs as near even size and color as possible. The eggs should be turned once a day to keep the yolk suspended in the center. It is best not to keep eggs more than two weeks. The fresher they are the better.

CARE OF INCUBATORS

The incubator should be started up several days before the eggs are put in. Heat slowly and gradually turn up the flame. Watch it constantly, and when the thermometer registers 103, screw the nut on the connecting rod until the cap over the lamp is raised about

one-eighth of an inch. It is important to know that the regulator is working all right before the eggs are put in. After the temperature is regulated, put in the eggs and close the doors, and do not open them for forty-eight hours. It takes the eggs from thirty-six to forty-eight hours to get warmed through, so do not be surprised to find that the thermometer does not register 103 right off. Just keep the flame as you had it before the eggs were put in.

The lamp should be filled and cleaned and the wick trimmed every night. This insures a good steady flame through the night.

After the eggs have been in the incubator forty-eight hours, they should be taken out and turned twice every day. It is not necessary to turn them completely over each time, but just enough to keep the yolks from settling to one side.

On the seventh day the eggs should be tested and the infertile ones taken out. This is done by inclosing a lamp in a box,



40—ACTIVE, HEALTHY CHICKENS

ARTIFICIAL INCUBATION

with a hole in one side the shape of an egg. Hold a fresh egg up to the light and it looks perfectly clear. When a fertile egg has been incubated seven days, a dark spot surrounded by a network of small veins can be seen. All eggs that still look clear after the seven days' incubation, are infertile and should be taken out. These infertile eggs can be used for cooking or can be boiled and fed to the young chickens. On the tenth and fourteenth days the eggs should be tested and the dead eggs removed.

The chickens will commence to hatch on the nineteenth and twentieth days. After the hatch commences, do not open the door of the incubator until the end of the twenty-first day. A great many of the details of the management of an incubator have to be learned by experience. Full directions for operating accompany each incubator and should be carefully studied before the incubator is started up. There are quite a number of good incubators on the market. Avoid buying an inferior machine because it is cheap.

THE MORTALITY OF CHICKS

AN INTERESTING INVESTIGATION INTO THE CAUSES OF DEATH IN INCUBATOR CHICKS, AND THE MEASURES THAT WILL PREVENT SAME—MORTALITY GREATER AMONG FEMALE CHICKS THAN AMONG MALE CHICKS—FAULTY INCUBATION

JAMES R. COVERT



THE rapid growth of the poultry industry within recent years has been largely influenced by the perfection of the incubator. True, high priced meat has been a factor, but the setting hen has long since been distanced, and commercial poulterers could do little without the incubator.

Just now the topic of greatest interest is "what incubator shall I buy? Which is best?"

Singularly, every one who has at any time run an incubator feels qualified to give advice.

In buying an incubator, two things may be remembered to advantage. No machine can hatch an infertile egg and no machine is fool proof. In other words, our first consideration should be fertility and vitality in the egg; secondly, intelligent faithful manipulation of the incubator. These statements are repeated in substance many thousands of times by incubator manufacturers; they are hoary-headed truisms, but ever new to the tyro.

The feeling that the "latest is the best" is common to many. Without knowing why, these persons insist on having the very latest and their satisfaction and sense of security when the latest is finally purchased are so great that neglect of ordinary and reasonable precautions often follow to the detriment of an otherwise good hatch.

While much greater perfection in the art of constructing ingenious contrivances for incubation does not seem probable for the future, the case is different with brooding. The great mortality among incubator chickens is an engrossing subject. In this connection the results of post-mortem examinations into the cause of death of 826 incubator chickens, a study recently made in Rhode Island, are interesting and instructive.

These studies were made for the purpose of ascertaining with as much certainty as practicable the proportion of incubated chickens which die, the causes of death, and what measures are best adapted to check the losses.

CHIEF CAUSES OF MORTALITY

Of the 826 dead chickens examined, 387, or about 47 per cent., were males, and 439, or 53 per cent. were females. Thus, it would appear that the mortality among female chicks is greater.

The diseases discovered as a result of the post-mortem examination range themselves under four different heads: (1) hereditary or faulty incubation; (2) mechanical causes; (3) imperfect sanitation; (4) improperly balanced rations.

First, to heredity and faulty incubation may be ascribed the deaths that occur before extrusion and the abnormalities.

Recent experiments conducted in Germany demonstrate that alternate periods of heat and cold occurring during incubation influence very largely the proportion of cripples. Of the 826 dead chickens examined, 33 per cent. died as a result of hereditary weaknesses or faulty incubation. The weakness exhibited by these chicks resulted in a greater liability to disease or in abnormalities. Fifty eggs selected from certain breeding pens were incubated. Of the 50 eggs, 27 proved fertile, 19 chicks hatched, and of these 19 only 12 remained alive at the end of ten days. Six of the dead chickens were tuberculous and all of them had enlarged gall bladders.

Not one of that lot reached maturity. The excessive mortality is attributed to congenital weakness, since chicks from other parents did well under exactly similar conditions.

EFFECTS OF INHERITED WEAKNESS

Constitutional weakness may manifest itself in those cases where the yolk is not absorbed at the normal rate. Just previous to pipping, the unassimilated remnant of the yolk of the egg is drawn within the body cavity of the young chick. This yolk sac is connected by a narrow tube with the intestine and through this tube the liquified yolk enters the intestine, there to undergo digestion and absorption. This yolk within the body cavity of the young chick provides it with proper pabulum until the chick has gained sufficient strength to provide additional nourishment through the mouth. While the young chick is gradually acquiring strength, this unassimilated yolk within its body is gradually disappearing as the chick is able to assimilate larger and larger quantities of food by the mouth, until, finally, at the end of perhaps a week, under natural conditions, the yolk has practically disappeared—absorbed into the alimentary canal and there assimilated as required.

Now if this process of absorption is unreasonably delayed, whether by reason of abnormalities, congenital weakness, or an over abundance of food through the mouth, the food provided by nature as best suited to the chick fails of assimilation, weakness results, the unabsorbed yolk decomposes, and the chick is poisoned—"bowel trouble," it is called. In a large proportion of the chicks in this experiment which died just previous to hatching, the yolk had not been drawn into the body cavity, and 13.3 per cent. of the chickens which hatched, but subsequently died, showed trouble connected with the yolk sac.

Mechanical causes, many of them clearly preventable, occasion the death of many chicks. Means of prevention suggest themselves to all who are familiar with the details of brooding, and no extended discussion is deemed necessary.

Imperfect sanitation, poor ventilation, and want of sun-

ARTIFICIAL INCUBATING AND BROODING

light are fruitful causes of high mortality, notwithstanding the fact that young chicks are generally allowed as much liberty as is consistent with satisfactory growth.

PREVALENCE OF TUBERCULOSIS

More than 15 per cent. of the post-mortems in this study revealed the presence of tuberculosis—the bacillus was located in the dark, poorly ventilated brooders, and it was here that the chicks contracted this most insidious disease. Many a person casually examining a brooder is misled by the fact that it is scrupulously clean and absolutely louseless, and overlook the danger of infection from tuberculosis, a disease very prevalent among fowls. German statistics show that 10 per cent. of the adult fowls killed in that country are tuberculous.

Of the 15.1 per cent. tuberculous fowls examined in this study, 113 chicks had tubercles in the lungs, 5 on the walls of the heart, 5 on the walls of the gizzard, and 1 on the intestines. The lungs, then, appear to be the principal seat of infection, over 90 per cent. of the diseased chickens having tuberculous lungs. Tuberculosis is to be suspected when whitish, cheesy lumps appear on any of the internal organs, and, as a matter of precaution, the lungs of fowls should not be utilized as food.

Sunlight was found to be the most efficient and cheapest germicide. Affected hovers were removed from the brooders and set in the full sunlight and allowed to air for a day. This simple expedient reduced the evidence of tuberculosis in the infected brooders from 50 per cent. to only 3 per cent.

Congestion of the lungs, due to sudden alterations of the temperature and exposure, claimed a large percentage of victims, 243 chickens, or 29.4 per cent. of the mortality, being attributed, more or less correctly, to this trouble.

DIGESTIVE DIFFICULTIES

But the greatest interest attaches to the study of those cases showing symptoms of indigestion. Of the 826 chicks which died of disease, 625, or 75.6 per cent. had more or less trouble with the gall bladder—closure of the gall duct, leading to an enormous accumulation of gall, and a paleness of the intestines. This condition is readily recognizable in the living chick. The green gall stains adjacent organs and the abdominal wall and a distinctly green area is conspicuous outside the abdominal wall, close to the posterior edge of the breast bone, on the right side of the midline. The affected area appears as though mortification had set in, even before death.

To ascertain the cause of this accumulation of gall and consequent mortality, a feeding experiment was instituted. Four pens of approximately 50 chicks each, all conditions being identical, were fed a varying ration.

To pen No. 1 equal parts of egg (from the incubator) liver, and grain, boiled together and chopped fine, were fed. Green

food in abundance, consisting of sliced onion, oat sprouts, etc., was fed.

To pen No. 2 was fed grain and green stuff—no animal protein. The mortality in this pen was 9.5 per cent., of which 75 per cent. was due to digestive trouble.

To pen No. 3 grain alone was fed—animal protein and green stuff were omitted. Mortality 32.7 per cent., of which 76.5 per cent. was due to digestive trouble.

To pen No. 4 was given egg, liver and green stuff—no grain. In this case the mortality was 63.7 per cent., of which 85.8 per cent. was due to digestive trouble.

THE IMPORTANCE OF A BALANCED RATION

This feeding experiment very strikingly indicates the necessity of a well-balanced ration for young chicks. If chicks immediately after or even before death show this green area on the right side, the amount of meat in the diet should be increased. The weights of the chickens surviving in the above feeding experiment, taken at the close of the test, very forcibly demonstrated the fact that the increased amount of animal protein, in combination with the grain ration, not only reduced the mortality due to indigestion, but also caused a more rapid growth than was observed in the case of chicks not similarly fed.

For the purpose of providing a better balanced ration for young chicks, the author has instituted a feeding experiment of his own, using blood meal as a source of animal protein. Blood meal is well-known as a specific in calf scours, and from its abnormally high content of animal protein, its use in feeding young chicks is expected to reduce to a minimum the mortality from bowel trouble. Compared with animal protein derived from other sources, such as beef

scrap, its use would appear to be more economical, yet it is not thought desirable to make blood meal the only source of animal protein in feeding young chicks.

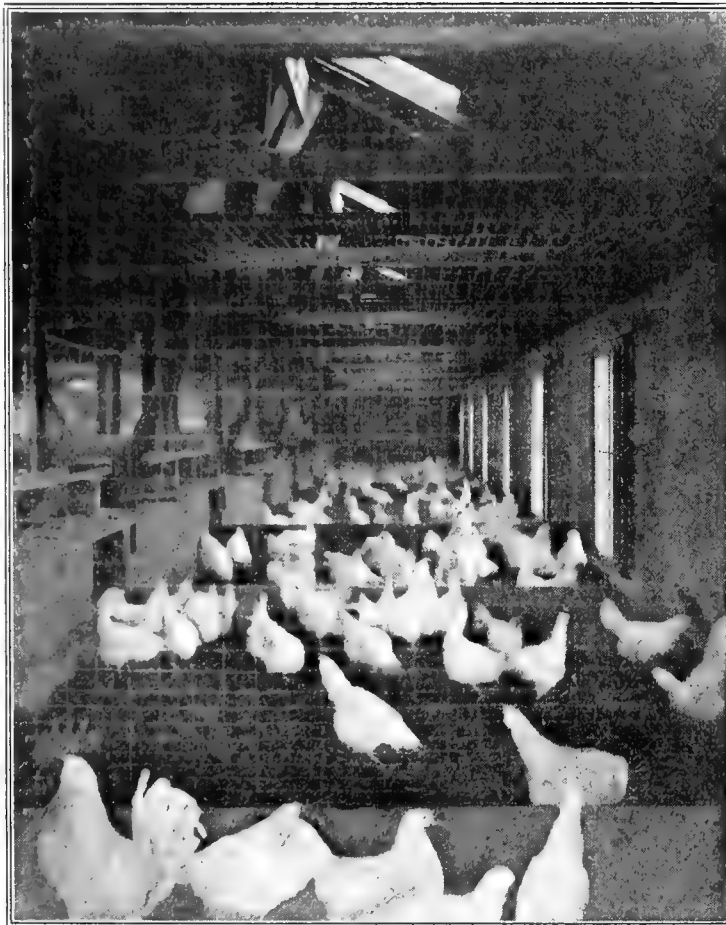
A NEW EGG TESTER

AN ORDINARY CALCIUM CARBIDE BICYCLE LANTERN WILL GIVE ADMIRABLE RESULTS

J. D. STEVENS

THE following may be of interest to many incubator operators who, like the writer, ride a bicycle, and frequently have to avail themselves of the use of a bicycle lantern in getting home on a dark night.

The lantern we use is a calcium carbide which, as is well known, needs only the application of water to generate acet-



41—WHITE LEGHORNS IN A LONG CLOSED-FRONT HOUSE

ARTIFICIAL INCUBATION

lyne gas, which burns with a perfectly white light and with great brilliancy.

Having occasion to use the egg tester on an incubator full of eggs, we decided to try the lantern for that purpose, and after having fitted over the lens a piece of black enamel cloth with a hole in it, we discovered much to our surprise and gratification, that it was far ahead of any so-called egg tester we had ever used. The intense white light seemed to make the egg about as nearly transparent as is possible, and in dark shell eggs we had no difficulty in detecting the fertile eggs at the end of the third day of incubation, the minute blood vessels being distinctly discernible. We shall continue to use the lantern hereafter in preference to the regular tester, because of its unquestionable superiority.

We advise those who have a carbide lantern to try it.

There is also a hint in this to the manufacturers of egg testers.

THE HATCHING OF CHICKS

THE IMPORTANCE OF CORRECT TEMPERATURE IN INCUBATORS—LOCATION MUST BE DRY—HATCH THE CHICKS EARLY

W. F. CHAMBERLAIN

I RAISE and keep from one thousand to fifteen hundred chickens each season, and if I can give any information that will help a beginner and save him one little chick, I will feel well repaid for my trouble. Generally it seems to be the best that die; any way we miss them more, and fret ourselves with thoughts of what they might have been. It is far better to use some precautions, some care and so avoid these troubles.

See that your eggs come from strong, healthy stock, and do not set eggs from stock that you know has been diseased at any time, as it will show in your little chicks some time and cause you trouble when you least expect it. Use old stock for breeding if you can, as I believe old hens and roosters produce the best and strongest chicks. If you cannot use old stock, use a cockerel with old hens or a cock with pullets. I find that the first eggs a hen lays hatch stronger chicks than the last eggs she lays, and it might be well to bear this in mind when you set your hens or fill your incubators.

INCUBATORS

See that your incubator is placed in some place where the temperature does not change any more than possible. A bright, dry, well-ventilated cellar is certainly an ideal place in which to hatch chickens by artificial or natural means, but the air in a damp, close cellar will so poison the germs developing in the eggs that satisfactory hatches are impossible. If the cellar is not dry and has windows that can remain open throughout the hatch, the machine should not be located in it. A north room—unheated—is far preferable, or an open shed. High-percentage hatches can be turned out in an ordinary woodshed with an earth floor even during the warm months of June and July.

Warm up your machine at least twenty-four hours before you place your eggs in it, and see that it is perfectly regulated and that the temperature is as near one hundred and three degrees as possible. When you place your eggs in the machine you will notice that the temperature will drop very fast on ac-

count of the eggs being cold but do not be alarmed, as the temperature in the machine will soon rise, and if your machine is well regulated, in a few hours the temperature will again be up to one hundred and three degrees. A few degrees below one hundred and three during the hatch will not cause any trouble, but a few degrees above one hundred and three is approaching the danger point. You will have to watch the temperature of your machine very closely, and run it as near one hundred and three as possible. See that the eggs you put in the machine are fresh and clean and as even size as possible; that is, do not use any great big eggs or any very small ones. Watch the lamp in your incubator carefully. Have a regular time to fill and trim it, using a match to rub off the charred wick. Hatching chicks with an incubator is like any other business, you will have to go through just so many ups and downs before you get there, and while you can get some good information from your incubator catalogue, you will get more lasting information from your first few failures, for experience is the best teacher in the chicken business as well as in all other business. Do not forget to turn and cool your eggs, as the cooling of the egg is life and strength to the little chick, and if you do not give this part of the business your careful attention, you will have very poor hatches, and those that do hatch will be weak.

EARLY CHICKS GIVE GOOD RETURNS

Hatch your chicks as early in the spring as possible, as it is the early chicks that count and bring you in good returns,

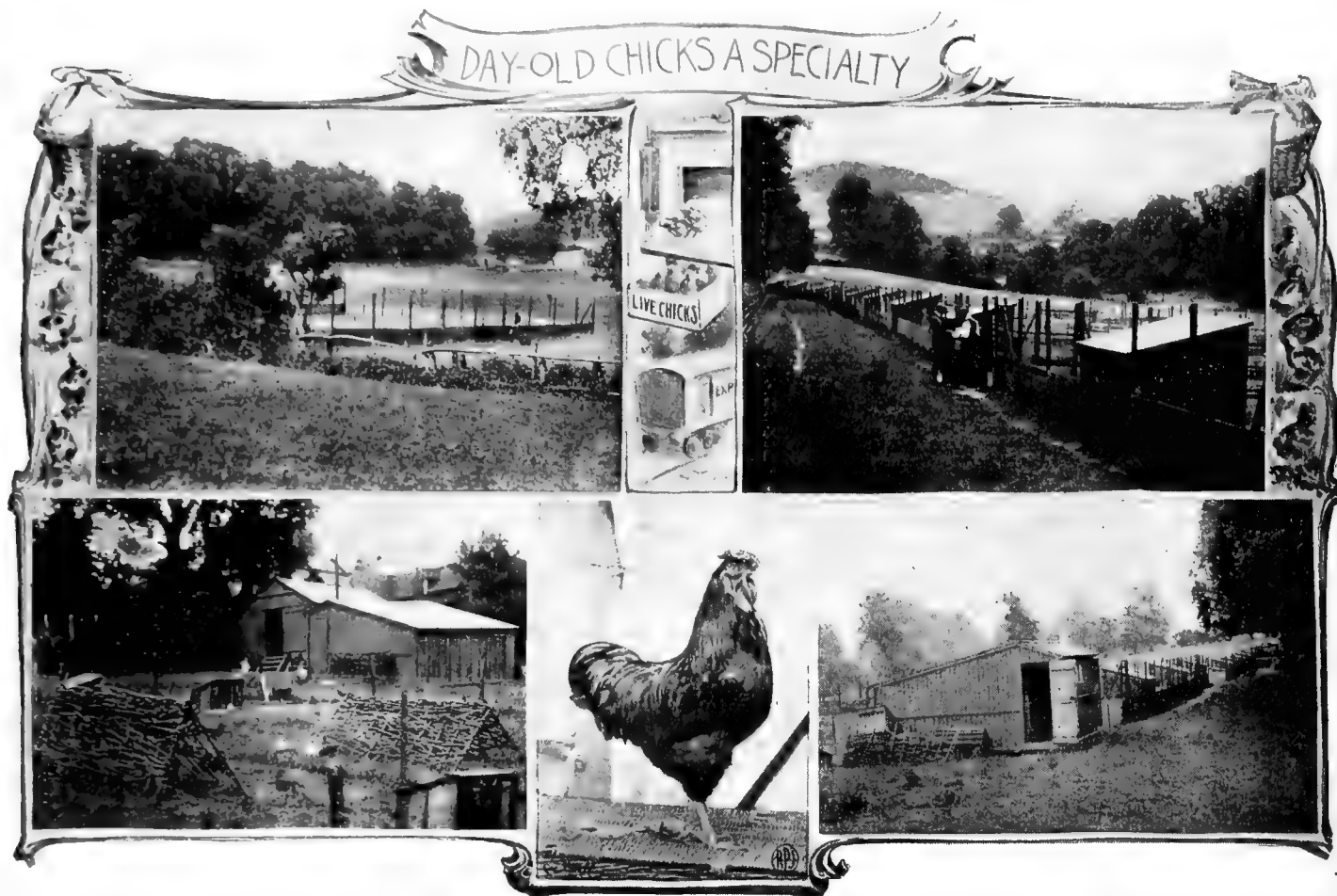
because they grow quicker, keep healthier and lay earlier. Early chicks run all day long and grow every minute in the day, while late hatched chicks spend most of their time hunting for some cool, shady place, and only range a few hours morning and evening. This lack of exercise and feed



42—AN ACETYLENE LIGHT EGG TESTER

causes them to grow very slowly and in fact they never make the growth they should. When your hen comes off with her brood in the early spring, see that she is put in a roomy coop and that the coop is placed in some dry shed with a window in it, so that the little ones can come out and scratch around when the ground is dry. Little chicks can stand lots of cold weather if kept perfectly dry, and will make wonderful growth. Later on when the weather is warmer and the storms are not quite so bad you can place the coop under a tree and build a yard in front of it, with poultry netting, so that the hen can come out and dust herself and enjoy the sunshine while her little chicks have free range. You will be surprised how many you will raise in this way and how easy it is to take care of them. We have had the hottest summer we ever knew, and I hatched late and raised about seven hundred Leghorn chicks, and my loss was about seven per cent. Considering the weather, this was remarkable. It may be a little trouble for you to make your hen and chicks comfortable, but you must not hope to succeed without this trouble.

THE DAY-OLD CHICK INDUSTRY



SELLING DAY-OLD CHICKS

THE SALE OF DAY-OLD CHICKS IS BECOMING POPULAR IN ENGLAND—AN ENGLISH FARM DEVOTED TO THIS INDUSTRY—A NOVEL ROOM FOR EIGHTY-FOUR SITTING HENS—HOW PAPER BOXES ARE MADE COMFORTABLE FOR SHIPPING THE CHICKS

FRANKLANE L. SEWELL

TWO hundred acres of well kept orchard and vegetable gardens within easy driving distance from the London markets, looked like profitable gardening to the writer, whose home is in the Michigan fruit belt.

We passed nearly a half a mile of these productive gardens operated by three brothers whose fine fowls are well known throughout Great Britain, and found ourselves at the picturesque old house long ago built by Henry VIII as a "hunting box" for Queen Anne Boleyn. This quaint house was then at the edge of the Windsor forests. Here we found the poultry plant well arranged, partly among the plum and apple trees and partly over the adjoining meadow. We were pleased to find the combination of poultry with fruit growing, and to be told that the finest fruit was gathered from the trees under which the fowls had liberty throughout the season. We asked if the fowls did as well in the open meadow as in the orchard and were told that they succeeded about as well on the open meadow. The birds in the orchard appeared the brightest and most industrious and we noticed that most of the breeders and laying hens were yard-

ed there. The extra work of carrying the fruit out of the yards was mentioned as against having the poultry pens among the fruit trees. However, it was quite decided that the improved quality of the fruit, not counting the increased quantity, make up for the extra work. Properly arranged gates might make carting of the fruit quite easy.

ORPINGTONS, WYANDOTTES, LEGHORNS, MINORCAS AND DUCKS

The breeds kept were Buff Orpingtons, White and Silver Laced Wyandottes, Black Leghorns, White Leghorns and Black Minorcas; also Aylesbury ducks. These occupied four breeding pens next to the incubator house, twenty yards in the orchards and twenty yards in the meadow.

Besides these breeding yards there was one large field with a row of fruit trees through the center where 125 laying hens were kept; also about two acres of orchard in which were eight houses occupied by about 222 laying hens, two warm brooding houses with yard attached, and a large cold brooding house of eight sections, in which last house the youngsters were three to four pounds in weight, just about to be changed to the four grassy yards next the brooder house.

THE DAY-OLD CHICK INDUSTRY

PREFERRED THE "SITTING BREEDS"

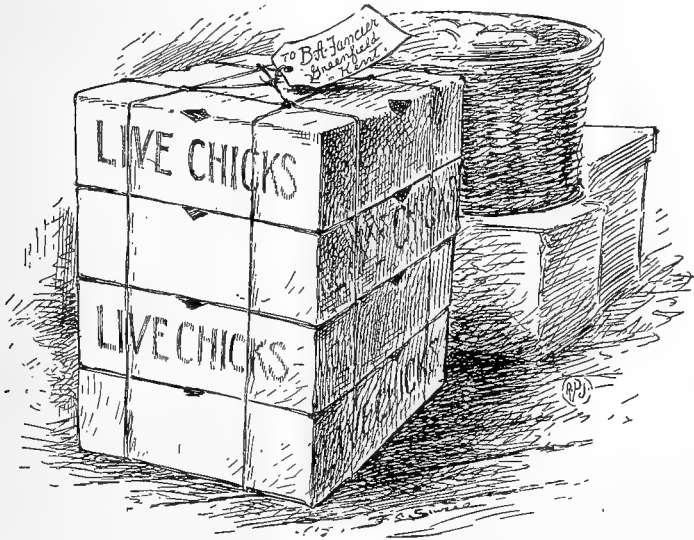
All but the brooding and incubator houses are of portable types. We were told that they liked the "sitting breeds" best for their business, as they had experienced the best success with them in artificial hatching and rearing—found them easiest to handle, stronger and not too apt to "go off their feed" in cold, bleak weather, and seeming to hatch well at almost any season. This was partly a surprise to us as some of our earlier experience had led us to class the Mediterranean breeds among the most fertile breeds.

We were impressed by the vigor and healthy condition of all the stock and inquiring about the feed were told that they handled them "on the rough-and-ready scale," plenty of good coarse feed—boiled mangles, (large, coarse beets) with middlings mixed in until a good consistency is reached and then add about 10 per cent of beef scrap or meat meal—occasionally barley meal is mixed with the above. The large grassy runs explained much towards the birds' strong constitutions. Whole grains,—corn, wheat and oats,—were being fed the large stock for the evening meal.

At the incubator house we found fifteen incubators, fourteen of American pattern and one of an English type. The incubator house is single boarded, with windows in the north slope of the roof and these were curtained to keep out the sun. "The room for sitting hens shades it on the south," they explained. It is against the warmth of the sun that they guard their incubator rooms over in England. The cold that they have is not often so severe as to cause trouble with incubation by the best machines.

MANAGING 84 SITTING HENS IN ONE ROOM

We have never seen such a handily arranged outfit for managing sitting hens. There were eighty-four nests on the inside of an alley-way and five airy pens for exercising and



43—SHIPPING DAY-OLD CHICKS.

Four dozen day-old chicks shipped in strong paper boxes, one dozen in each box. Air holes are cut with a knife at the center of the upper edges (as shown in the illustration). The four boxes are securely fastened with a cord.

feeding the hens on the outside of this alley-way, as seen in the photograph. Each hen was banded on the leg with the number of her nest, so after her time for an outing she could be returned to the proper place. The sides of the nests were formed by a square sloping frame, which was movable and rested upon a continuous board bottom, extending from end to end of the tier of nests at a height to bring the top of this movable portion level with the bottom of the door. Just inside each door was a six inch wide platform, so that if any old cluck became restless and would not sit, she had some place to dance her jig on besides her clutch of eggs. All woodwork was thoroughly whitewashed after each sitting.

INCUBATORS ARE A NECESSITY

"Well," we said, after looking this outfit over, "with all this handy arrangement, why do you need incubators?" He shook his head and replied, "We are in the day-old chick business—that's why we have incubators." They want the chicks first of all, early—then they want them in large lots—not late and irregularly when the good old hens take a notion to quit laying and become broody. They keep several hundred hens to supply fresh eggs. These eggs are mostly ordered by dealers whom the elder of the three brothers meets when disposing of the vegetables and fruit at Convent Garden's Market. The restrictions of this market being entirely for flowers, fruits and vegetables, it does not permit of displaying eggs there, but they will meet many grocers who require strictly fresh eggs for their trade, so receive many orders in that way, the eggs being shipped from the farm directly to the shops without being exposed in the market.

PAPER BOXES FOR SHIPPING THE CHICKS

We wanted to know more about how the day-old chicks were shipped, and were shown into the shipping room where the strong paper boxes used by this firm were packed, just as they came from the box factory—flat. A box was quickly put into shape for shipping—"and what do you put into the box to make it soft for comfortable traveling?" Reaching for a good-sized handful of soft hay which was bent round into a nest-like form inside the box, then for a handful of soft feathers, with a couple of strokes round the opening in the hay lining, it looked very comfortable, "like a sparrow's nest" they explained, and, "it's just comfortable for twelve chicks (the number placed in each box) to turn round in and keep each other warm." The contents of the box is marked on it so no mistake can be made after packing and as many dozen tied together as are ordered by each patron. The sketch will show where the boxes are cut in the middle or upper edges for ventilation. Properly marked for shipment, and the little orphans are ready to start for their new home. The porters of the trains seem to take quite an interest in the little things and handle them with the greatest of care. Often they can be seen listening at the air holes to hear the peepings of the wee travelers—and I believe they get safer handling in the paste board boxes than when shipped in the less fragile appearing wooden cases.

FIFTY DAY-OLD CHICKS ARRIVE SAFELY IN GERMANY

This firm has sent day-old chicks to the Isle of Wight, and up into Scotland. Another order that no doubt required quite as much handling and changing about with as much time as would be required for any shipment of a thousand miles in America, was a lot of fifty-day old chicks that went to a gentleman near Berlin, Germany. We saw a letter from the customer, stating that all had arrived alive. Fifty were sent to Southport (250 miles) with only one dead, and 250 to the Isle of Wight, all arrived safely.

Just twice as much for day-old chicks is received by this firm as for the eggs for hatching, and they had hatched an average the past season of 250 chicks from 360 eggs (with the sitting breeds) and had good sales from January to June, so they were very well satisfied with the profits from their season's trade in day-old chicks.

There seems every reason that our breeders in the United States and Canada should enlarge the profits from their poultry farms by adopting a method of selling day-old chicks.

The method of gathering the eggs for hatching is worthy of mention. The care and the system of record employed is such that a mistake in breed or number is almost impossible. The eggs from the large flocks of laying hens of course needed no regard as to record of pedigree, only to be sorted as to size and color.

ARTIFICIAL INCUBATING AND BROODING

HATCHING CHICKS FOR SALE

A FARMER RUNS 77 INCUBATORS—25
NEIGHBORING FARMERS SUPPLY EGGS

A. F. HUNTER

WE HEAR poultrymen say, now and then, that they hatch chickens for their neighbors at 5 cents apiece, or some agreed upon price, and occasionally we hear of cases where men having incubators have taken up the work of hatching chickens for others as an additional source of income. It has frequently occurred to us that there were great possibilities in this direction; that a man who had a faculty of operating incubators successfully could make a good living by hatching chicks for farmers who were too busy, or not sufficiently well equipped to do the hatching themselves. Hatching chicks for others is no new thing, as we know of the celebrated Egyptian hatching ovens, in the operation of which men make a livelihood and where the usual method is to pay two eggs for a newly hatched chick. These Egyptian hatchers must be remarkably successful in their operations, if they can deliver a chick for two eggs and make their profit out of the marketing of the hatch. Undoubtedly they do make a profit, else they would not continue in the business. As it is the consensus of opinion that an average of a 50 per cent hatch is all that can reasonably be expected, taking the season through, our American incubator operators would hardly make a living hatching upon that basis. We know a gentleman in Canada who has been quite successful in building up a hatching trade. He began by hatching for some of his neighbors, charging them five cents per egg for the use of the machine and his trouble; from that it was an easy step to hatching his own eggs and selling newly hatched chicks, and without any advertising he has developed a considerable trade in newly hatched chicks and in some instances has shipped them to considerable distances.

We know of one man in New Jersey who has successfully shipped in the east to Maine and New Hampshire, as far west as Dakota and Nebraska and as far south as Florida, and the sample testimonials as to the condition of the chicks on arrival indicate that there are scarcely any losses and that the shipping of chicks even to these great distances is entirely successful.

A visit to this "hatchery" gave us some interesting points and a brief account of the methods employed will not only be interesting, but will point out the way to others taking up this profitable line of work.

The owner of this plant uses 77 incubators and is apparently making money out of the new-old venture. He buys his eggs for hatching from farmers thereabouts, whom he has induced to keep good, thoroughbred stock for the purpose. There are about twenty-five of these farmers now supplying him with eggs and he pays them five cents a dozen above market price.

The chicks are Barred Plymouth Rocks and White Leghorns, these being popular farm varieties. He has also added Buff Plymouth Rocks to his list and for these he gets a higher price because the eggs are harder to get.

It is surprising to learn that he does not test the eggs at all, his statement being that he had thought it did not pay to bother to test them. In this we disagree with him, because the absolutely clear eggs tested out by the fifth or sixth day could be sold to bakers and used in many ways. They form excellent food for chicks and would be so much salvage. He told us that from 360 eggs in each machine he averaged to ship 175 to 200 chicks.

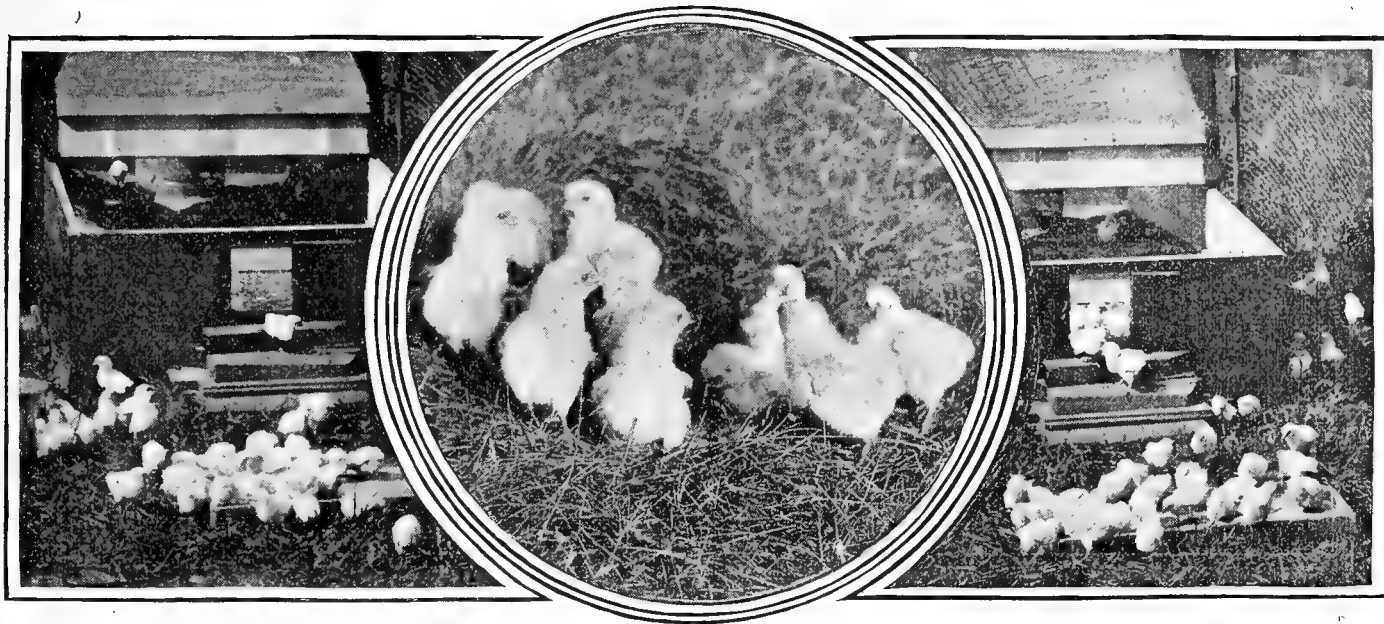
The chicks are shipped when about twenty-four hours old in shallow, flat boxes which are about seven inches deep. A burlap cover is tacked over them about 3½ inches from the bottom, or half way from the bottom to top of the box. No other covering is put over them, excepting that in cold weather there will be two thicknesses of burlap. According to the number of chicks to be shipped.

Ordinary boxes are bought of the grocers, and if they are more than eight inches high they are cut down to the desired size. A box, say two and one-half feet long by ten or twelve inches wide, would have a partition in, dividing it in halves, and fifty to seventy-five chicks will be put in each end. These boxes are all made ready and the burlap cover tacked on, with the exception of two or three tacks out of one corner (or one corner of each compartment if it is a long box divided in halves); the chicks are slipped in through the untacked corner, which is then secured in place and the package is ready for the expressman. At the time of our visit a man was busy preparing these shipping boxes and was kept busy at that work four or five days in a week. This gives one an idea of the extent of the business. A strip of cover-board four or five inches wide is nailed on top to tack the shipping tag onto, and the shipment is complete.

This is a very interesting story, and tells much as to the possibilities of the development of the poultry interest. Here is a man shipping newly hatched chicks all over the United States, even as far west as Nebraska and Dakota and as far south as Florida. The question arises: "Why are there not hundreds of hatching stations, scattered say one or two in each county, to do the hatching for those who do not care to do it themselves?"



ARTIFICIAL BROODING



SUCCESSFUL BROODER OPERATION

INDIVIDUAL BROODERS—THE WAY TO MANAGE THEM—HOW AND WHERE TO LOCATE THEM—THE NUMBER OF CHICKS TO THE BROODER—PROPER BROODING TEMPERATURE AT DIFFERENT AGES—GETTING READY FOR THE CHICKS, ETC.

P. T. WOODS, M. D.



AS soon as the hatching season has well begun, attention is naturally turned toward the proper means of brooding the newly hatched chicks. For the beginner brooding by the individual brooder method will undoubtedly give the most satisfactory results. Nearly all of the leading makes of brooding devices give satisfactory results when operated under favorable condi-

tions. In most cases the outdoor style of brooder will prove the most satisfactory since it may be used under a greater variety of conditions. Where indoor brooders are used they must necessarily be run in a house or room of some sort throughout the entire season while outdoor brooders may be run under shelter or in a house during the early part of the season and then removed to the orchard or field after the weather has become warmer and more settled, and the houses or shelters may then be devoted to growing stock or to other uses.

In buying a brooder be sure to obtain one of standard make from a reliable manufacturer. The best is none too good. As a rule, it will not be wise for an amateur to attempt raising chicks with a home-made brooding device, as such are seldom properly constructed and often cost more than the well-made, properly built machines sold by reputable manufacturers. Do not buy a brooder simply because it is cheap. Remember that the best is the cheapest in the end and that the little extra money expended at the start will be more than offset by the saving in losses and the ease in caring for the chicks. The best individual brooding devices are those which supply a considerable volume of top heat combined with just enough bottom heat to give a warm floor in the hover apartment. A properly constructed brooder will be so made that it is entirely self-ventilating, drawing pure fresh air from outside of the machine, carrying it up and distributing it beneath the hover and around

the chicks so that they are always supplied with pure fresh warm air while the brooding apartment is maintained at the proper temperature.

LOCATING THE BROODER

During March and April it is best to run the individual brooder of outdoor pattern in a small house or at least under a shed or shelter. Personally I prefer to use a house having a floor space 6 by 8 or 8 by 10 feet according to the size of the brooder. Such a house should have a door and a glass or canvas window in its south front. It should be so arranged that the door and window can be kept open throughout the day and a wire screen should be provided to keep the chicks inside if the weather is not favorable for their having an outdoor run. When so placed the chicks have a good sheltered exercise room outside of the brooder on the floor of the house where they are protected from wind and storm. The operator will also find such a location for his brooder much more convenient for attending the lamp and caring for the chicks. Here in New England many such brooding houses are in use and they are particularly desirable because of the sudden and extreme weather changes occurring during the early spring. A house of this sort if placed in a well-drained, dry location may have an earth or sand floor; as a rule a tight board floor is best since it affords protection against dampness and also keeps out rats and other marauding vermin. If a board floor is used, cover it with an inch or two of sand.

After the weather has become settled in May and June the brooders may be run beneath a tree in the orchard or may be located in the open field. Later in the season when run in the open field it is a wise plan to provide a sun shelter for both a portion of the chick run and the brooder itself, since it is almost impossible to run any brooder at anything like an even

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temperature when it is exposed to the full glare of the sun for the greater part of the day.

When placing the brooder in position do not make any excavation to receive it, but place it on the top of the ground, making it as level as possible. Use a spirit level on the floor of the hover apartment from side to side and front to back to make sure that the brooder is leveled up properly. Unless the brooder is level the heat will not be distributed evenly. If with the brooder in this position it does not fit down tightly to the ground on all sides, bank up around it with a little earth so that the wind cannot blow under it. If the door by which the chicks leave the brooder is not on a level with the ground, make a little inclined run-way of earth and sod leading up to it from the ground. Two or three pieces of sod turned upside down make the best sort of inclined run-way and with ordinary attention will last as long as needed. Do not use a board for this purpose. Where a board run-way is used the chicks are liable to get beneath it or lose their way when very young and fail to get into the brooder and beneath the hover before they are chilled. With an earthen sod run-way the chicks will learn to find their way in and out in a very short time and the operator will be saved a great deal of unnecessary trouble.

THE BROODER LAMP

There are many styles of brooder lamps, a number of which seem to be more in favor in some sections of the country than in others. It should be borne in mind that the brooder stove or lamp, like all other kerosene heating apparatus, is very liable to give trouble unless properly cared for. A brooder stove or lamp has to run for many weeks without an opportunity to thoroughly cool off and rest and therefore should be treated with much greater care than an ordinary house lamp which is only run for a small portion of the 24 hours. The brooder lamp must be kept clean, particularly the burner portion. The wick tube should be kept free from accumulations of crusts, the burner should be kept as bright and clean as possible and the perforated disc about the wick tube must be kept clean and bright and free from dirt; its perforations must be kept open. The wick should be trimmed daily and should be slightly rounded at the corners to prevent burning with a fish-tail flame. A flame of fish-tail shape is liable to result in one or both sides of the flame burning too high, reaching against the chimney part of the stove or other metal parts and causing smoking, which is almost certain to bring disastrous results.

Of the two types of brooder stoves in most common use the style with chimney made of Russia iron held together with iron castings and fitted with water pan above the oil bowl and the chimneyless lamp equipped with a zenith or railroad burner, are probably the most common. The stoves with the water pan, when run in the old-fashioned way with the pan filled with water, are sloppy and disagreeable to care for and the pan must be kept always full of water, or else the insulation of the oil bowl is not complete. The writer prefers to fill up the water pan with asbestos cement, such as is used by plumbers for insulating portions of hot-water heating apparatus. This asbestos can be obtained in a dry form and is easily made ready for use by simply mixing it with sufficient water to reduce it to a putty-like consistency. The water pan may be filled full of this and it will soon harden, making a good insulating body that will insure protection of the oil bowl from the heat of the lamp flame. When this asbestos insulation becomes old, soiled, or should oil be spilled upon it, it can be readily removed and replaced with new at the expense of a few cents.

Use only the best grade of kerosene oil in the brooder lamp and be sure to keep the lamp full, fill it twice a day if necessary. When running the brooder in cold weather it is a wise plan to fill the lamp twice a day, morning and night. In warm weather when operating with a low lamp flame it will

seldom be necessary to fill the lamp oftener than once in 24 hours. Never turn a brooder lamp so high that it cannot be turned higher without smoking and never turn it so low that you cannot turn the flame a little lower without the lamp going out. If these directions are observed and ordinary common sense care given to the lamp there will be very seldom any trouble from the kerosene heater used for individual brooders.

Nearly all brooder lamps are pushed in place on a wooden slide. Be sure to see that the lamp is in its proper position. In brooders having a metal floor, with a place for the lamp to sit immediately beneath the central portion of this metal floor, care should be taken to see that it is correctly placed, since if the lamp sits to one side the brooder will not heat as evenly. Where there is any tendency for the lamp to heat up it will be found more satisfactory to have the bottom of the lamp rest on the earth beneath the brooder rather than on the wooden slide, since the oil will be kept cooler in such a position. For convenience the writer prefers to cut a circular hole through the lamp slide big enough to admit the bottom of the lamp; across the bottom of this opening I fasten two iron or tin straps to keep the lamp from settling beneath the lower level of the slide. This leaves practically the whole bottom of the lamp exposed to the earth beneath the brooder, keeping the oil much cooler.

GETTING READY FOR THE CHICKS

When the little chicks are expected to hatch have the brooder heated up and ready to receive them. Over the floor of the brooder, in both the hover chamber and exercise apartment, sprinkle a little fine sand, over this about one-half inch deep, place cut clover, chaff or other fine litter material. In this may be sprinkled a little chick grit and a good dry grain chick food. Run the brooder for a day or two before the chicks are placed in it to be sure that it is running properly and to get it thoroughly heated up. The temperature beneath the hover before the chicks are placed in the brooder should register 95 degrees in brooders having a wooden hover. In brooders having a metal hover, which supplies a portion of the top heat of the hover space, the temperature should be at about 90 degrees at the start. The little chicks should not be placed in the brooder until they are from 24 to 36 hours old. It will be the wisest plan to put them in the brooder in the afternoon so that they can have a little time for the first meal and then go early to bed for the night. When the chicks are treated in this manner they learn more quickly to use the hover and to find their way back and forth. If they are placed in the brooder in the morning and spend the whole of their first day there, they are liable to huddle more or less in the corners and may become chilled.

PROPER BROODING TEMPERATURE

As will be noted in what has gone before, brooders having a wooden hover should be run at a little higher temperature than those which have a metal hover supplying a considerable radiating surface for distributing heat beneath it. In brooders having a wooden hover run the hover space temperature at 95 degrees for the first week, gradually dropping to 90 degrees the fourteenth day. Continue reducing the temperature to 80 degrees by the twenty-first day, dropping to 75 degrees by the end of the fourth week. For the balance of the time which the chicks remain in the brooder maintain a hover space temperature of about 75 degrees.

In brooders having a metal drum hover start with the hover space heated to 90 degrees with the thermometer in its proper position (all brooder manufacturers indicate the position where the thermometer should be placed). Maintain the temperature as near 90 degrees as possible the first week, gradually dropping to 85 degrees by the fourteenth day and to 80 degrees by the twenty-first day. Reduce the temperature to 75 de-

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grees by the end of the fourth week and run at this temperature while the chicks remain in the brooder. These temperatures are given for the hover space when the chicks are outside. The operator should always aim to keep the chicks comfortable and to be guided fully as much by the appearance and actions of the chicks as by the temperature indicated by the thermometer. Many experienced operators running individual brooders pay no attention whatever to the thermometer, depending on the appearance and actions of the chicks to guide them. Their rule is to have sufficient heat under the hover so that the chicks will be comfortable. When they are warm enough the little chicks will be found ranged about the edge of the hover with their heads peeping from beneath the felt. If they are not warm enough they will be bunched up out of sight underneath the hover or will show a tendency to huddle and crowd. If allowed to remain in such condition, they will be almost certain to be chilled by morning. It is always wise to have a little surplus heat at night. In apartment brooders where the chicks have an opportunity to get away from the source of the heat there is very little danger of their becoming overheated. When they are warm enough to stay around the edge of the hover at bedtime they will, when the brooder cools off as the night grows colder, gradually draw nearer the source of heat underneath the hover and so keep comfortable all night. If a brooder operator will carefully and closely observe the habits of his chicks he will have little difficulty in properly brooding them.

In running the brooder on warm nights it may be found advisable, where double felt curtains surround the hover, to raise the outer row of felts, or in metal drum brooders having removable felts, to remove the felts altogether.

It is probable that more of the troubles which beset the amateur in raising brooder chicks are caused by either overheating or chilling the chicks than from faulty feeding. It is as dangerous to overheat them as it is to chill them. The well made, modern, up-to-date brooder, if properly operated, will readily take care of temperature changes occurring outside of the machine of from 10 to 15 degrees, but where there are greater changes than these it will be necessary to provide promptly for offsetting them by either turning the lamp flame up or down as needed.

THE NUMBER OF CHICKS TO THE BROODER

As a rule brooder manufacturers rate the capacity of their brooding devices much too high for practical purposes. Seventy-five or even 100 newly hatched chicks may be placed in the brooder having a brooding apartment 36 inches square with a hover two feet in diameter, but such a brooder is not adequate for raising this number of chicks to weaning age. Fifty chicks to be carried to weaning age are enough for one flock in any brooder. It will be much wiser for the beginner to start his brooder with only fifty chicks, since, if more are placed in the machine he is almost certain to lose some of them until they thin the flock down to that number or below it.

SUGGESTIONS AS TO BROODER MANAGEMENT

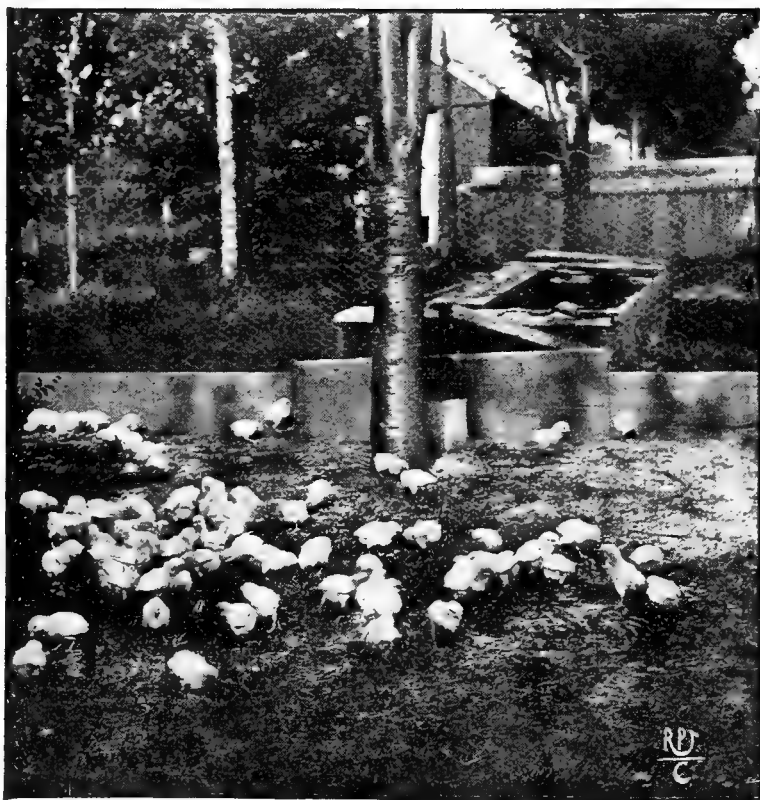
When the chicks are first placed in the brooder give each a little drink of pure fresh water by dipping its bill. After this keep water where they can have access to it at all times, but do not place water dishes in the hover chamber where they can slop over and wet the floor and litter material. In addition to the chick food and grit, sprinkled in the litter, give the little chicks for their first meal a little dry stale bread crumbs barely moistened with sweet milk. Feed this for the first two days, then discontinue and feed exclusively on dry mixed grain chick food. After the fourth day keep good pure beef scrap con-

stantly before the chicks; also see that they are supplied with chick-size grit and charcoal. Green food should be given early and fed at regular intervals.

In brooders having removable wooden hovers, take off the hover while the chicks are being fed during the first week. In this way you will make sure that all the chicks come out from under the hover and get a chance at the food.

Do not permit any weaklings in your brooder flock. Weakly chicks are not worth raising and serve only as a setback to the healthy ones. It will be best to put them out of the way before they prove a source of injury to the balance of the flock.

After the chicks have occupied the brooder 24 to 36 hours they should be provided with a little outside run; limit this run at first to a short distance beyond the inclined run-way and do not have it wider than the front of the brooder. Increase the size of this run gradually as the chicks become accustomed to their new quarters. Watch them closely for the first few days to make sure that they do not crowd or bunch up outside of the



44—OUT-DOOR BROODER IN SHADY LOCATION

machine and help them to learn their way to and from the hover, which is the source of heat.

Be sure to always leave the ventilators partly open; never attempt to entirely close up the brooder; the chicks must have an abundance of fresh air to breathe if you are to raise them. Every day, if possible, sun and air the interior of the brooder and when practicable expose the under side of the hovers and the felts to the direct rays of the sun for a little time each day. Where the chicks are confined in chick shelters or small wire enclosed runs, remove the brooders to fresh ground at least once in two weeks.

In the early spring brooder chicks will do much better in moderate sized runs than if allowed wider range. Later in the season they may be given larger runs, but it is a wise plan to keep them somewhat confined until they are large enough to be weaned from the brooder, since they are liable to injury from sudden storms unless they are kept within easy distance from shelter. After weaning from the brooder and removal to colony coops the wider range they have the better.

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KEEP THE BROODERS CLEAN

Change the litter and replace with new litter material and sand at least once a week. The brooder must be cleaned often and kept clean. After the brood has been weaned be sure to thoroughly clean and disinfect the brooder and thoroughly scour the floor and sides of both brooding and exercise chamber with good yellow soap and water. If a little creolin or other non-poisonous disinfectant can be added to the water so much the better; if creolin is used, add one teaspoonful to each quart of water used for scrubbing. After washing out the brooder, dry as thoroughly as possible and then expose the parts to strong sunlight. If possible place the brooder where it will be in a strong current of fresh air, as this will materially aid in the drying and cleansing process. Remember always that sunlight is the best natural disinfectant and purifier and that thorough exposure of the interior of the brooder to sunlight will do more to kill disease germs than anything else.

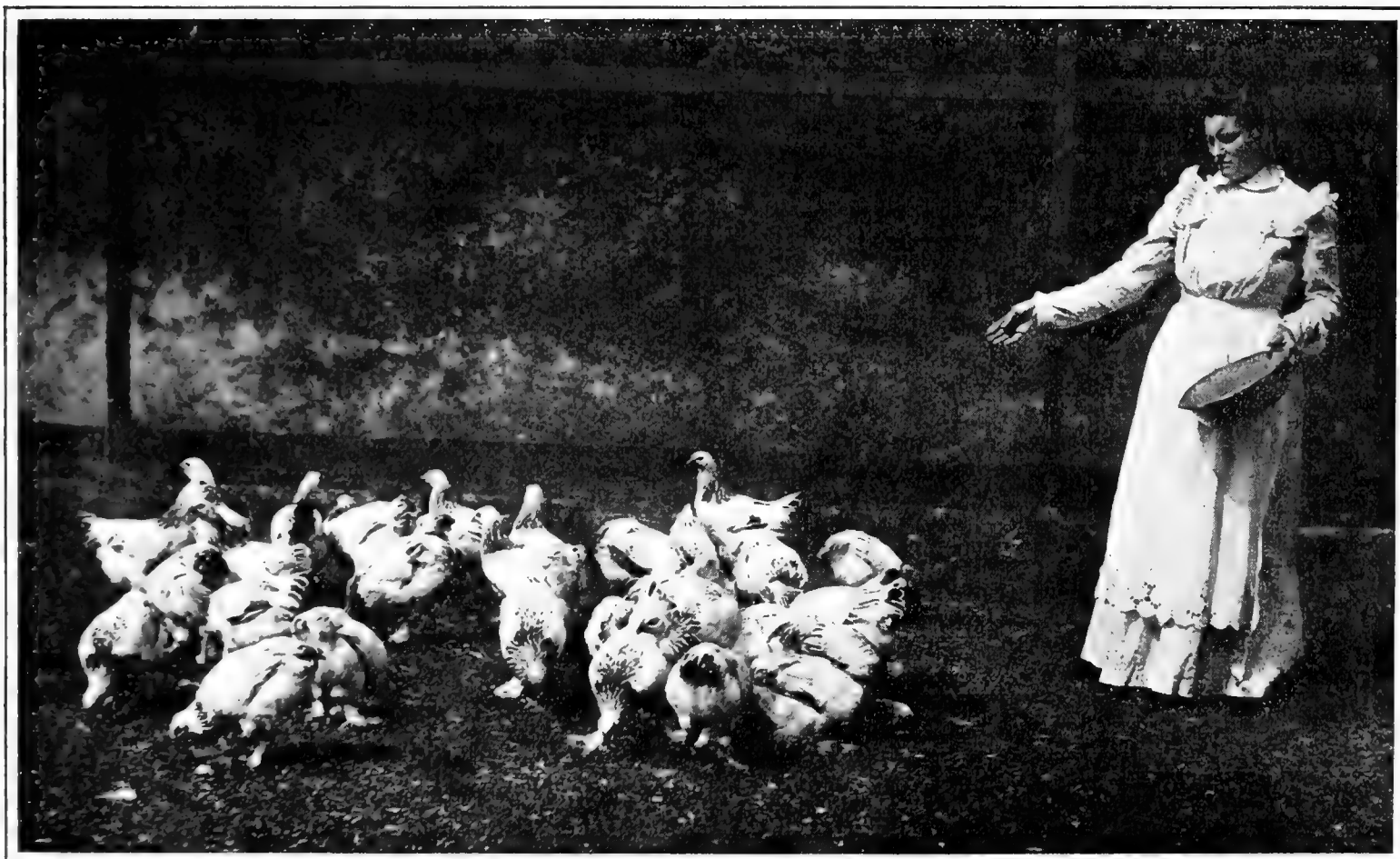
Where brooders have been in use for some time and the woodwork has become stained and darkened it is a good plan to give the interiors a thin even coat of good hot whitewash. Do not add disinfectants to whitewash used on the interior of

CARE OF BROODER AND CHICKS

PREPARATION FOR THE CHICKS—SIMPLE METHODS PRODUCE POSITIVE RESULTS

C. H. CURTIS

OUR experience with brooders and brooder chicks convinces us there is a good deal to be taken into consideration. Under right management it is a simple thing to run a good brooder and raise healthy chicks. We will give some of our methods of operating a good brooder. In the first place when we begin to think about incubating eggs we begin to plan how to take care of and provide for the baby chicks. When they arrive, brooders that we are to use or the coming season, whether old or new ones, are given a general overhauling, something like this: They are thoroughly cleaned and renovated, and then we use a good lice destroyer inside. We do this for several reasons. One is we commence to kill lice before the chicks go into the brooder; the next reason is, it makes a good disinfectant and helps to keep the air pure in the brooder. We



45—COLONY OF LIGHT BRAHMAS AT THEIR NOON MEAL

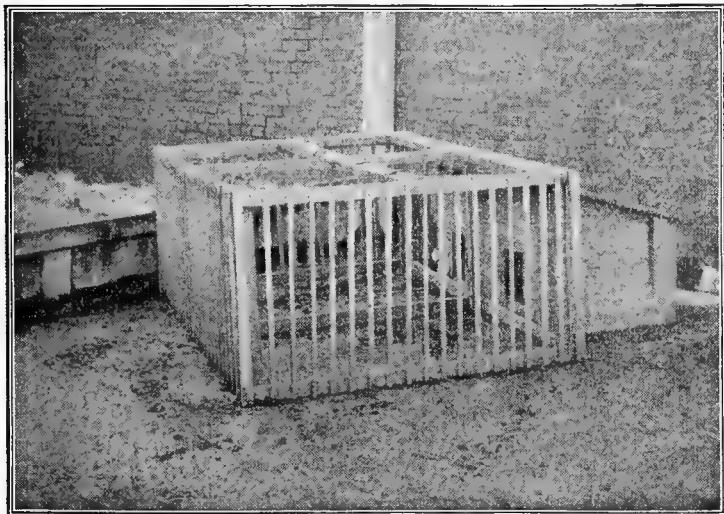
the brooders. The whitewash will also aid in lighting up the interior of the brooder when the lids are closed.

At the end of the season when the brooders are to be stored for winter, be sure to clean them up thoroughly as advised above. Never put away your brooders badly soiled from a season's use; thoroughly clean and disinfect them. Before storing be sure that the brooder is in good repair and thoroughly sweet and clean. Store in a dry place protected from the weather. If you are careful to follow this plan the brooder will be easily made ready when needed at the beginning of another season by simply exposing it for a while to fresh air and sunlight. In brooding chicks as in all other lines of poultry work, it is the careful attention to details—"the little things that count" that brings success.

use the liquid lice killer and allow it to thoroughly dry, after which we cover the bottom of the brooder with dry sand (such as is used for building plaster) to the depth of an inch or an inch and a half. This we find to be a very good litter for the hover or mother part of the brooder, as it makes a dry floor for the youngsters to travel over, and also helps to keep the floor at a good temperature for warmth. The droppings become dry and hard upon this litter, and when you come to clean the brooder it is very easily and quickly accomplished. We have a small hand rake for this purpose, and every morning the droppings are raked up and removed from the brooder, for we believe that you cannot keep a brooder too clean nor the air in the brooder too pure for the good of the youngsters.

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About three or four days before our hatch is ready to come off we start a slow fire in the brooder, to dry it and heat it up throughout. Then just before placing in the chicks we run the temperature of the brooder up to 90 degrees and keep this temperature under the hover from eight to ten days. The temperature we do not guess at, for we think that is poor manage-



46—BROOD COOP AND PEN

A lath pen of this type is almost a necessity where mature fowls have access to the yard where the chicks are fed. Special food is given in the pen and the fowls cannot reach it.

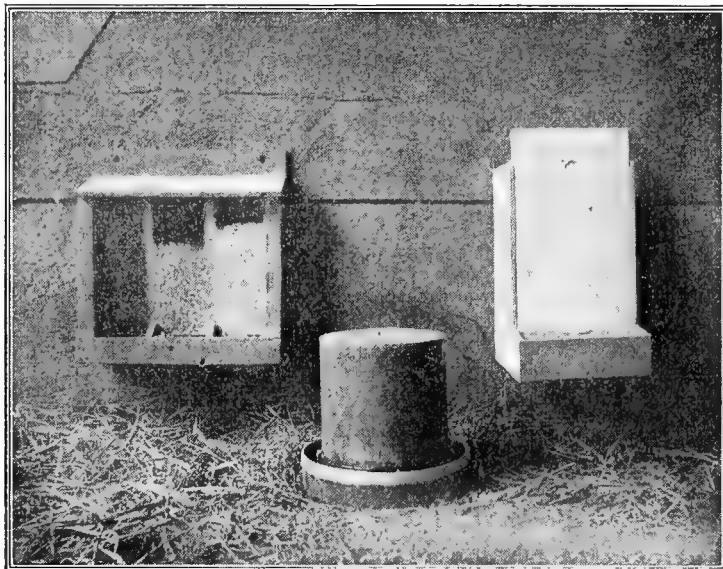
ment, for these reasons: If the chicks become chilled they get a very serious set-back; it gives them bowel trouble, causes them to crowd and smother one another, and gives the operator all kinds of trouble to get them straightened out again. Too much heat is about as bad as too little. It makes the youngsters weak, gives them leg trouble, colds, and causes them to lose their appetite, a most essential thing for little chicks to have if they are expected to thrive. To insure an even temperature place a thermometer in the hover so that the bulb of the mercury is raised about two inches from the floor. Then keep the hover at 90 degrees for eight or ten days, and after that the temperature can be dropped to 85 degrees for five or six days and then to 80 degrees. This we find to be a good temperature until the chicks are six or seven weeks old.

We like the hot air brooders for several reasons, and we also prefer the center heat. We find that if there is any crowding on the chicks' part that they crowd to the center and keep making room for one another, hence they do not smother each other by crowding into the corners. In a hundred chicks size brooder we never place more than seventy-five newly hatched chicks, and generally after the first ten days we are obliged to remove about half of the youngsters to another brooder. This is not only beneficial to the youngsters, but is also better for the operator, for this reason; he can feed the more robust chicks heavier than he would the weaker ones and the stronger chicks do not domineer over the weaker ones. One thing we are careful to avoid is not to feed or water the chicks in the hover part of the brooder. We place their food and water in the outside part of the brooder and compel the youngsters to go there to supply their wants. We take special notice at every feeding that every chick comes out to get something to eat. If they do

not we put them out and watch them very closely to see if they partake of the rations set before them. If they have not been over fed previously they will take hold with the others. If they do not, and stand around dumpish, we remove them to other quarters. We also feed them in such a manner that they cannot trot through their food or water, getting themselves wet and all gummed up and then go back under the hover and get that to smelling foul, thus causing sickness in the youngsters, for which the brooder is often blamed.

It is good policy in the spring, just as soon as the weather will permit, to get the brooders and chicks out doors, so that they can get all the fresh air possible.

Another thing I should like to mention is this: In the late spring or early in the summer it is not a good idea to set the brooder and chicks out of doors so that the rays of the sun can strike on the hover part unless the cover is raised to allow the warm air to circulate in the hover freely. Then just before the sun's rays leave the brooder, close it up so as to keep it from getting damp with the night dews. Do not allow the fumes of the lamp or heater to pass directly into the hover, as this is very injurious to the youngsters. It gives them catarrh, sore eyes, and in many cases kills them outright. If you have a brooder with too much bottom or top heat, look out for all kinds of trouble with the youngsters. Last, but not least, when you have finished the season's work with brooders and have no further use for them, don't let them stand around in the weather, but remove to dry quarters, empty the lamps, brush out the brooders and set them away until you want them again in the spring. With this kind of care your brooders will pay for themselves many times over and last for years, as there is comparatively



47—THREE USEFUL DEVICES


On the left is a three compartment grit and shell box with glass front. On the right an adjustable feed hopper. In the center is a drinking fountain.

little wear and tear on them, and they are just as good to use in after years as they are when you first get them. If you are using incubators, do not try to raise chicks without the help of a good brooder. It is just as essential to have as a good incubator, because it is to your profit to raise as many of the chicks hatched as is possible.

READY-MIXED CHICK FEEDS

ADVANTAGES OF ITS USE—COMPOSITION—THE MOST ECONOMICAL FEED FOR YOUNG CHICKS—COMPARED IN FEEDING QUALITY WITH OTHER FEEDS—SHOULD BE FREE FROM DUST AND EVERY GRAIN ABSOLUTELY SOUND, SWEET AND DRY

M. L. CHAPMAN

HE proper feeding of poultry is without doubt the most essential factor in the raising of any kind of poultry for profit. As this is the largest item of expense in the running of a poultry business, it is a subject which every poultryman should study with a considerable amount of original common sense, as there are no hard and fast rules that can be laid down as applicable to every case,—climate, breed, price of grain and general environment all having to be considered in determining the proper rations.

Considerable advancement in the feeding of poultry has been made in the past few years, especially in the feeding of little chicks. The old way of feeding chicks was to mix up meal and water, or meal and sour milk, making a sort of dough for them. On nearly all the large poultry farms, chicks are now started entirely on some modern, ready-mixed, dry-grain chick feed.

In my travels about, however, I find that many farmers who raise quite a lot of poultry, still follow the old system from a false idea of economy, reasoning that if a bag of meal costs \$1.25 and a bag of that "new-fangled" chick feed \$2.50, that they are a winner by a dollar and a quarter.

"ONE HUNDRED POUNDS OF CHICK FEED WILL GO TWICE AS FAR AS ONE HUNDRED POUNDS OF MEAL"

But let us figure a moment and see how it actually works out. In the first place it is almost an impossibility to feed a dough of this sort without wasting a great portion of it, as the hen will scratch it around amongst the dirt and the little fellows will patter it down in the mud. Any that is left is soon soured by the sun, and is then great stuff to place the chicks among the dear departed. Now consider the \$2.50 a hundred feed: In the first place it is all ready and can be fed much more quickly. If any should be left on the ground, it is all right for the chicks to pick up an hour or so later, when some of the youngsters become hungry again. It is composed of several different kinds of grain, and will nourish the chicks properly. I have tried both ways, and can state positively that a hundred pounds of good chick feed will go twice as far as a hundred pounds of meal, it can be fed more conveniently, will start the chicks much faster, and the mortality is much less with it.

Let us investigate what a first-class chick feed should be composed of to qualify for the best standard. There are a large number of chick feeds on the market varying in price from \$2 to \$7 per hundred weight. Some of the firms who manufacture chick feed are in the business because they were selling poultry supplies or in some way were in touch with the poultry trade when the demand for balanced rations began to grow. The men in charge know very little about poultry or the grain business, and while their product is undoubtedly better than the old ground grain method, it is not as perfect as is possible for a well-equipped milling plant to produce. Of course, such a plant must have a competent man in charge of the poultry feed department, one with a practical knowledge of poultry and scientific knowledge of feeding. There are many so-called balanced rations, chick feeds, egg forciers, etc. on the market that are made by parties with little or no knowledge of poultry, that it behooves us to be careful that we do not spend our good money for a mess of pottage.

Every one who buys grain should make a study of the State Experiment Station Report on Foods. Much information about different foods can be obtained, although it must be remembered that the hen does not always analyze food the same as the chemist.

"EVERY GRAIN IN A BAG OF CHICK FEED SHOULD BE ABSOLUTELY SOUND, SWEET AND DRY"

Some manufacturers claim that their chick feed contains seventeen or eighteen different ingredients. While some variety is necessary in a perfect chick food, it is not necessary to have as many ingredients as this. It is essential, however, that every seed and every particle of grain in a bag of chick feed should be absolutely sound, sweet and dry; in fact, should look and smell tempting enough to eat. A chick feed that contains in proper portions, corn, wheat, oats, rice and millet, will present sufficient variety to properly nourish any chick. We have seen samples of chick food that contained a large number of different seeds, some of them of doubtful value, the idea seeming to be that the greater number of different seeds the food contained, the better it would sell. Now in order to combine so many different seeds in a feed to sell it at anything like the usual price, it is necessary to use a poorer quality of seed throughout, and to introduce many seeds which may or may not be of value to poultry, some of which may be injurious. We doubt if anybody can properly combine a chick food containing twenty different ingredients, and keep them all up to par.

The corn that is used in a chick feed should be two years old, as nearly all corn goes through a sort of fermentation the first spring, and does not reach its hardest and most perfect condition the first year. We have seen bags of chick feed that contained quite a large proportion of fine-cracked new corn that arrived from the manufacturer so hot that you could not hold your hand in the bag, and the feed had to be spread out on the floor and turned over for several days before being re-sacked and offered for sale by the dealer. Such chick food will quickly place your chicks in the absent column.

CHICK FEED SHOULD BE FREE FROM DUST AND WASTE

Some chick feeds are made from a good quality of grain, but are not blown sufficiently clean after cracking, and you will find by running them through a fanning mill, that you can take out about twenty pounds of fine meal to the hundred. Of course, this twenty pounds is an absolute loss, as when the chick feed is scattered on the ground or in litter, the chicks cannot get the dust. Try to buy a chick feed that is practically free from dust and waste.

We have examined chick feeds offered for sale that actually contained 15 per cent of grit, 10 per cent of fine cracked oyster shells and about 10 per cent of charcoal, although it might not be safe for a manufacturer to put out a chick feed without some grit in it, as many people cannot be depended upon to furnish their chicks with any kind of grinding material; however, such a large percentage of grit, shells and charcoal as above is nothing short of a roast on the buyer, as these ingredients can be purchased separately for about half a cent per pound.

Charcoal is a good food for small chicks and they should have it, but when it is combined with chick feed and shipped

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around the country, the most of it is powdered into dust. We believe the most economical way to feed it is to buy the charcoal and prepare it at home.

THREE CENTS FEEDS A CHICK BEYOND THE DANGER POINT

Some chick feeds are composed very largely of shrunken grains of wheat, and small weed seeds that are blown out from grain at the large elevators. Such feeds are of far less value than a feed that is composed entirely of sound, selected grains broken to the proper size, and blown free from dust, so that practically the whole bag can be fed without loss. Ordinarily such a feed can be bought at retail for about \$2.50 per hundred weight, and it is the best and most economical feed that can be used. There are a number of such foods on the market

RAISING BROODER CHICKS

VALUABLE HINTS ABOUT CARING FOR
CHICKS ENTRUSTED TO THE BROODERS

MRS. W. B. CHANDLER

I HAVE been peculiarly fortunate in raising brooder chicks, and though I do not claim to be "all-wise" on the subject, perhaps if I tell how I manage them it may help some less fortunate one to see wherein she fails.

A lady said to me the other day, "Oh, you always succeed with everything." That was not true, and I knew it, but I said nothing and let it pass. But one thing I do know, and that



48—POULTRY HOUSES WITH WOODLAND RANGE

and if you exercise a little care in buying, you will be able to find one that will answer all requirements, and will solve the feeding problem for you, as far as the young chicks are concerned. One hundred pounds of such feed will carry 75 or 100 chickens pretty well past the danger point, so that the expense of feeding a chick until it is well started is only about three cents.

In feeding chick feed to chickens that are running with hens carry a pail of corn and throw out a small handful to the hen. It is just as good for her as the more expensive chick feed.

Do not neglect to provide green food and some form of animal food, if your range does not supply them in sufficient quantities. If you are able to solve the other problems as well as the feed, your chickens will be present or accounted for when the fall round up comes.

is that I never give up to one failure. I try again and again until I force at least a partial success from my efforts. All of which means if your chickens die off the first time you try to raise them in a brooder, try it again, and do things differently, thinking over each step and searching out the cause of your failure.

The day the chicks are due to hatch I light the lamp in the brooder so that it may be thoroughly warmed. Previous to this, however, I have carpeted the whole brooder with burlap, tacking it in the corners and a few places at the sides, so it will stay in place. Over this is strewn a good covering of oats chaff (gathered at threshing time) in which all their feed is scattered. I use a commercial chick feed and the wee Biddies have to scratch for it in the chaff. The first week this chaff need be changed but once or twice, and a thorough brushing with a whisk broom cleans it quickly and perfectly. As the chickens grow older,

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the brooder must be cleaned oftener to keep it sweet smelling.

The first day they have no water, then it is given to them (a little warm) three or four times a day after they have eaten and is taken away again in half an hour or so. Believing that an ounce of prevention is indeed worth a pound of cure, I give, three or four times the first week or ten days, scalded fresh milk instead of water the first time in the day. By so doing I believe most of the bowel trouble will be prevented, and possibly all of it. As to the heat, I keep it so that few of them seek the hover; but I seldom, except on very windy days, shut the lid down tight. I put a small nail or a thin chip under, and so avoid the danger of overheating, by giving a means of escape for the hot air. The burlap on the floor of the brooder need be renewed only once in three weeks, usually. But that must be governed by the soil that is on it.

I like to get my chicks out on the ground by the time they are a week old, but sometimes, early in the season when the weather is bad, they have been in the brooder till three weeks old before ever getting onto the ground, and yet there was not a case of leg weakness. Perhaps the strictly grain diet which is furnished by the feed I use is responsible in part for this, but the thick covering of chaff on the floor of the brooder, in which their food is buried, is also a great factor in the case.

As to incubators, I think they are a good deal like children, all the better for a judicious letting alone. If one notices all the little naughty things a child does, one is pretty apt to be kept in hot water. If you notice all the little variations of temperature in an incubator, you will be kept in a state of anxiety and doubt all the time, but by letting it alone except at stated periods, say three times a day, you can judge much better how the regulator is working. The inequalities of heat will adjust themselves, and at certain hours you get the mean temperature.

NOTES ON DRY FEEDING

WHAT AND HOW TO FEED TO PRODUCE TWO-POUND CHICKS AT EIGHT WEEKS

DR. H. P. NOTTAGE

Dr. Nottage is a practical poultry keeper and has for a number of years practiced, and been an exponent of, dry feeding both chicks and fowls. His conclusions, therefore, can be considered as the outcome of experience and intelligent observation.—Editor.

I ASKED a well-known authority on poultry a while ago what he had found out to be the disadvantages of dry feeding and he responded, "I haven't found any yet!" If such is the experience of a man who for many years has been constantly visiting poultry ranches, it certainly may be a safe proposition for any one to consider, even though he has a large ranch, and may be afraid of losing money by changing methods. I have always contended that the safest way, at least for the beginner is to start with his little chicks direct from the machine, for there have been some who for various reasons, most of them avoidable, have got into trouble by changing horses in the middle of the stream. It seems as if some flocks of fowls have never had sufficient meat in their ration. Those hens may fill up on beef scraps to their hurt if the scraps are placed before them once, allowed to remain and they are at liberty to eat their fill. It is better in such cases to let them have access to the meat only every other day at first, or to see that the hopper feeds gradually, so that they have to work for what they get.

Another thing for which I have contended from the first is that little chicks right from the machine shall be allowed access to scraps at their first meal and ever after have all they

want. I have repeatedly seen warnings not to give them scraps until a week or two. I give mine all they want and bowel trouble is a thing unknown among my chicks. Here comes in the question of the kind of scraps one uses; and there may be the difficulty with some. Some grades of scraps are only fit for fertilizer. Every maker seems to turn out scraps different from another. We get them dry and fine; coarse and full of chunks of bone in big splinters; bright and lively looking, and dead and dull in appearance. I hope that as soon as poultrymen know and say what they want we shall get scraps uniform in consistency and quality. For dry feeding we need scraps that average one-eighth of an inch in size, bright looking, of a golden brown, in which the fibers of meat and small bits of bone appear, without the feathery and dusty appearance produced by an admixture of tankage. Let us stand for at least fifty per cent of protein. Before I knew much about scraps I fed a brand that was full of big splinters of bone that government analysis afterward proved to contain only thirty-five per cent protein. Tankage in scraps is detected by feathery strings of stuff that look as if little shreds of cotton batting had been rubbed in animal meal. Cottonseed Culls are sometimes used as an adulterant and give a similar appearance to the scrap.

We would not like to feed cracked corn that was half meal, as that would be considered as wasteful; neither do we want to feed scraps that are half meal. Let the meal be sifted out and sold as animal meal and give us scraps that are granular, so that we can detect just what each particle really is.

One of the questions that is most frequently asked is, "Can you grow chicks just as rapidly on dry food as you can with wet food?" With the breeds that are grown for broilers it is expected that you will get the most of your chicks to weigh three pounds to the pair, live weight at eight weeks and that some of them will weigh two pounds each. This is accomplished by feeding four or five times a day cooked food that is concentrated and forcing, using the formulas that experienced broiler raisers have found to be best suited to this purpose and even then it is expected that some of the chicks will "go off their legs" from over-feeding. You can produce the same weight of chicken by filling up a food box with one-third wheat and two-thirds cracked corn and let them have all the scraps they will eat, and you will not see as many get weak in the legs from over-feeding.

Speaking of the legs of your chicks, I would like to make an observation that has been made by visitors to my ranch. They have remarked the large sturdy legs that little chicks put on under this dry feeding as if to carry a large frame later on. It would be interesting to know if others have observed the same thing. One man who has used dry feeding off and on for twenty-five years wrote that during the years that he used dry feeding the fowls were larger, and that when he dropped back to the usual wet mash feeding he noticed a deterioration in size of both. Without making any attempt to breed for size of eggs, I know that my eggs have increased from about 22½ ounces to the dozen to about 28 ounces.

These are points for all to observe. Experiment stations are already working on these problems and we may expect in the next few years to learn some valuable things.

It requires a good deal of courage for one who has been accustomed to the old way of feeding to place a lot of food before chicks and let them have all they want; but thousands of poultrymen are now doing this with the best of results, both in growth, health of young chicks and breeding stock. Now is the time to plan for testing this method with your young chicks that will soon be coming on. Try a hatch or two with dry food and you will find that it not only saves time, but you will have fewer chicks that are sick, and a smaller percentage of mortality.

STARTING THE CHICKS

DO NOT FEED TOO SOON—DRY FOOD ENDORSED—NOT TOO MUCH AT A TIME
—TWO GOOD JOHNNY CAKES—FEED A VARIETY—VALUE OF PROPER HEAT AND
GOOD SANITATION—GIVE THE CHICKS FRESH AIR—AVOID ALL OVERCROWDING

A. F. HUNTER



ALL experienced poultrymen are aware that there is a large amount of bungling work done with chicks. Some feed too soon, some feed too much, some overheat in the brooders, some chill the chicks in the brooders or brooder house, in fact, there are very many ways by which chicken work is bungled.—and bungling work costs heavily in chick mortality. At a recent gathering poultrymen were discussing chicken experiences, and they quite generally agreed that the right starting of the chicks was the keynote to better success with their work. The good work done by incubators is not supported by good work in brooding and feeding the chicks, and while some were inclined to think the fault was in the brooding, others were strongly of the opinion that the careless or bungling work of the brooder operators, especially in the feeding, was chiefly to blame for the heavy losses.

EXERCISE CARE IN FEEDING

It is certain that much bungling is done in the feeding, and by not a few the bungling consists in feeding too soon, although with many it consists in overfeeding, feeding unsuitable foods, etc., etc. Take the point of feeding too soon, and if one studies the literature touching upon the subject he will find that there is great diversity of opinion among supposed authorities. It is generally conceded that the chicks ought not to be fed during the first twenty-four hours, and many maintain that they will do still better if not fed until they have been out of the shell at least forty-eight hours, and there are still other writers who stoutly maintain that still better results will be gotten if sixty to seventy-two hours elapse before the chicks are given any food.

We all know that the tiny chicks are well supplied with a nourishing food at the time of exclusion, as the balance of the yolk of the egg is absorbed into the chick's abdomen just before that period, which is nature's way of providing sustenance until supplies can be found, the absorbed yolk giving strength for the search. Common sense should teach us that they ought not to be fed until they have had a chance to digest and assimilate the absorbed egg yolk, and experienced chicken raisers are coming to believe that a very serious mistake is made by feeding before the chicks are forty-eight hours old. It is better that they get to be a little hungry before they are fed than that they be tempted to eat before they are really ready to digest food. If the chicks are "well hatched," they should be left in the incubator until the morning of the second day, and then removed to a well warmed brooder, which has chaff or finely chopped clover, etc., scattered over the floor, and a little dry chick-size grit and water given them.

DRY FEEDING ENDORSED

We say "feed some dry food" advisedly, because the consensus of opinion among experienced chicken raisers is coming to be that dry food, especially the first week or two, is the best. Among the advantages of feeding a dry food is that it does not sour if not eaten immediately, as does wet food; also the chicks will not overeat of it. When fed a wet (or moistened) food there is danger of their eating more than their tiny digestive

organs can take care of; and another important advantage is that this dry food can be scattered in the litter and the chicks made to exercise for it from the first. That common term, made to exercise, does not really express the idea. It is "natural" for a chick to exercise, that is, to scratch and search for seeds, grains, insects, etc., for its food, hence the inducing of exercise is simply feeding in nature's way. To secure this advantage and do away with the wide-spread dissatisfaction with present methods of feeding, many prepared chick foods have been put upon the market and are coming to be very generally used. These preparations furnish "balanced rations," that is, they are so blended (or compounded) of several different seeds and grains, rightly proportioned, that all the bodily wants are supplied; and the use of them has given most satisfactory results. Certain it is that the systematic feeding of these "balanced" foods gives complete immunity from bowel trouble, leg weak-



49—A THREE COMPARTMENT FOOD HOPPER
The hopper is made from a biscuit box as shown in the illustration.

ness, brooder sickness, etc., and users of them claim that with a right temperature in the brooder the mortality in little chicks can be reduced to a minimum, and the most happy result of increased profit will be the reward.

LITTLE AND OFTEN

Whatever kind of food is fed the good old rule, "Feed only a little at a time and feed often," should be rigidly adhered to; it is the veritable keynote to successful chicken raising. A most successful broiler raiser of our acquaintance says that overfeeding, especially of too concentrated soft foods, is the cause of very much of the infant mortality with chicks. Of course, if one does not feed the soft foods to little chicks, he does not incur the risk of overfeeding them. and as we said before, that is one of the great advantages of the dry foods consisting largely of seeds and grains, that the chicks will not over eat of them; an-

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other great advantage is that the foods are not too concentrated. If we study the natural way of chicks feeding, which is here a seed, there a grain, then a bug or worm, and that very much exercise in the way of running about, scratching and searching accompanies the feeding, we can readily understand that exercise or working for the food is a substantial aid to the process of digestion; hence we cannot too strongly urge that it is most reasonable, and will be most certainly profitable, for us to study and closely follow the natural way.

TWO GOOD JOHNNY CAKES

Probably the next method is feeding for the first week or ten days a well baked johnnycake; and the term well-baked ought to be made particularly emphatic, because it means a great deal. A johnnycake should be baked several hours, four to six hours, in a slow oven. Then it is an easily crumbled cake and should have no stickiness or doughiness about it. Two formulas which have been made by Dr. P. T. Woods, and have given good results in the hands of practical chicken men, are the following:

JOHNNY CAKE NO. 1

- Two quarts of bran (or shorts.)
- Two quarts of coarse corn meal.
- One quart of wheat middlings.
- One handful of good clean beef scraps.
- One handful of good chicken grit.

Rub these together dry with from two to four infertile eggs, and mix all together with barely enough skim milk to just moist-



50—EASILY CONSTRUCTED FATTENING CRATE

en it. Rub the whole into a moist, crumbly mass with the hands, then put in a well greased pan (a roasting pan about three inches deep is the best) and press down hard to stick cake together.

JOHNNY CAKE NO. 2

- Two and a half quarts of bran (or shorts.)
- Two and a half quarts of corn meal.
- Two quarts of ground oats, sifted.
- One quart of clover meal.
- One handful of coarse bone meal.
- One handful of beef scraps.

Mix all together while dry and then rub in half a dozen infertile eggs. Wet up with milk or water (or both) and add one heaping teaspoonful of baking soda and one teacupful of pure cider vinegar, mix the whole thoroughly into a stiff dough and bake three to six hours in a slow oven. It is claimed for this johnnycake No. 2 that, where chicks are not very strong and have a tendency to bowel trouble, it will prevent their pasting up behind.

A popular food for the first week with some chicken raisers is either cracker crumbs or dried bread crumbs thoroughly mixed with finely chopped, hard-boiled eggs, and a very little or no moisture added; but hard-boiled eggs are a very concentrated food and there should be at least four or five times as much cracker crumbs or bread crumbs as there is of egg. Pinhead oatmeal or rolled oats makes a superior chick food, and where pinhead oatmeal can be bought by the barrel (or bulk) at a cost not exceeding two and a half or three cents per pound, it is an excellent food. The little chicks should be fed four or five times a day, say every two or two and a half hours, for the first week or ten days; and all dry-grain mixtures should be thrown in the scratching litter to promote exercise; and if the soft feeding method is employed, some dry grains should be scattered in the litter to give variety and induce exercise. If chicks are fed a soft food all the food not eaten within a few minutes should be removed, so that it will not become sour from the heat.

FEED A VARIETY

After the first few feedings chickens need a variety of foods. The dry-grain chick foods supply this. Where other method are employed they should have, in addition to their johnnycake and mash foods, feedings of cut or rolled oats, cut wheat and granulated corn (this is fine cracked corn with the coarse cracked and fine meal sifted out, and is known in some localities as "corn grits".) Where a dry grain chick food is used a little pure beef scrap, which has been steamed or barely moistened by scalding water, should be fed each day after the chicks are a week old. The chicks should, after they are four or five days old, have one or two feedings a day of some bright, fresh, green food, like lettuce, cabbage or the fresh, green shoots of sprouted grain. Where it is possible to give the little chicks a clean grass-run, it will be beneficial.

After the first week, four times a day is often enough to feed. It is a mistake to feed too much or too often. The chicks need a little time between meals to work and get up an appetite. They must be kept hungry, but not too hungry, and with most people there is more danger of overfeeding than of starving them. If the chickens appear dumpish and do not take hold of their food eagerly, try lighter feedings and add more grit to their food. Feeding grit in such cases will often work wonders.

Until the chicks are ten days or two weeks old they will be fed practically the same, whether they are intended for market or for use as stock birds. If they are started right the battle is half won. After the second week the manner of feeding and caring for them depends on whether they are intended for broilers or roasters, or whether they are to become layers or breeders. If all are treated alike and the careless grower makes his selection of laying and breeding stock out of his "pushed-for-market" flock it will eventually prove a detriment to his poultry, and will in a short time find himself confronted with some of the many poultry troubles which result from failure to use good judgment.

KEEP THE RIGHT HEAT

Too much or too little heat in the brooder is the cause of not a little chick mortality; this also is very likely to manifest itself in "bowel trouble." If the brooders are overheated the little chicks get to perspiring, the pores of the skin are opened, and an exposure to a chilling atmosphere causes congestion and cold and a diarrhoea quickly develops. Sometimes too many cooks spoil the broth, and more than one brooder full of chicks

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has "passed over to the majority" through the interference of an over-zealous friend or co-worker.

A most forceful example of this over-zealous help was the case of an outdoor brooder full of chicks on a poultry farm in Massachusetts. It was coming on cooler at night and the zealous wife of the poultryman, while crossing the yard, passed the brooder and thought to herself: "It is going to be a cold night and these chicks need a little extra heat," so she gave a slight upturn to the lamp and flattered herself she had been good to the chicks. A little later the man having the brooders in charge was passing that brooder and he thought, "It is going to be a cold night and these chicks need a little more heat," and he, too, gave a little upturn to the lamp wick. Neither mentioned to the other the kindly thought for the good of the chicks, and when the man having the brooders in charge stepped out of the house the next morning there was a pretty little heap of ashes where the brooder full of chicks had stood the night before, and in the ashes were the metal parts of the brooder and the calcined bones of the baby chicks.

This is an extreme case, of course, but it well illustrates the danger of too many fussing with the brooder lamps. One person should be the responsible custodian of the brooders, and should be competent to judge whether more or less heat is desirable, and as he is depending upon results he will naturally take pains to keep the heat as near right as possible. All well equipped brooders of the present day have thermometers suspended within the hovers, so that it is easy to determine the temperature conditions under the hovers and decide whether more or less heat is wanted. A most successful chicken raiser of our acquaintance makes it a point to have the heat a little bit strong, and give a little extra ventilation to balance it; he believes that the better quality of air resulting amply compensates for the very slight increased cost of oil consumed.

POOR SANITATION.

There is no doubt whatever that indifference as to cleanliness is a prominent factor in chicken troubles. We all know that freedom from filth and vermin is positively required, and the great difficulty is we do not live up to our knowledge. Other work is pressing and crowds upon the time which should be given to proper care for cleanliness and the result is unfortunate. We do not realize how quickly chicks double and quadruple in size, and that with the increase in size there is a corresponding increase in the droppings and a corresponding increase in the need for cleanliness. Speaking upon this point a bulletin of the Rhode Island Experiment Station says:

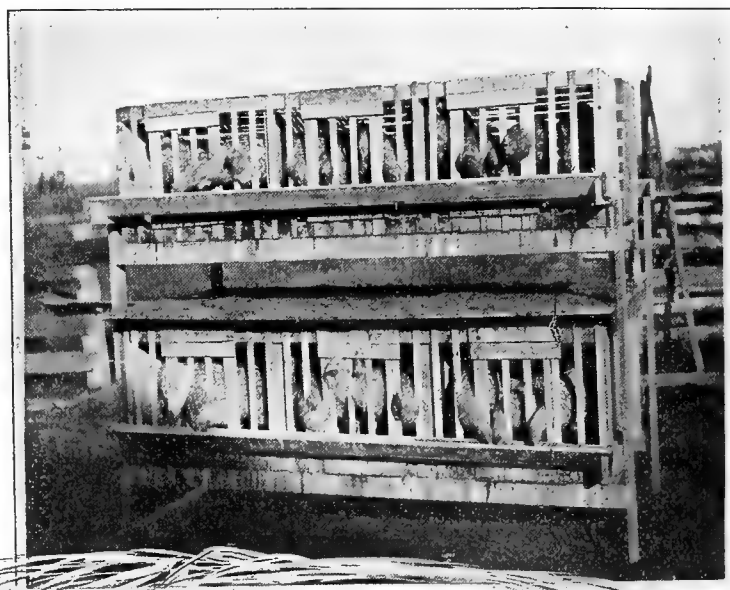
"Much more important are the fatalities grouped under imperfect sanitation. The veriest tyro at poultry raising knows that freedom from filth and vermin is a primary requisite and no reference to disease thus arising is here necessary. But particular attention should be directed to the fact that a brooder may be scrupulously clean and absolutely louseless, yet be the hiding place of disease germs far more to be feared on account of the insidious nature of their attack and the difficulty of detecting and combatting their inroads. Such a germ is that which causes tuberculosis. Tuberculosis is very prevalent among fowls. According to observations 15.1 per cent. of the chicks which died were considered to be more or less affected. * *

"Sunlight is the best and cheapest germicide for the tubercle bacillus. We found that the simple expedient of removing the hovers and setting them out of doors in the full sun all day reduced the evidence of tuberculosis in the post-mortem examination from nearly fifty per cent to only three per cent.

GIVE THE CHICKS PLENTY OF AIR

Lack of fresh air is another fruitful cause of chick mortality. Through false economy or mistaken kindness the brooders are

kept tight shut to prevent loss of heat, or to keep the chicks close to the heat supply, and the result is they do not get sufficient good, fresh air to breathe. A reasonably healthy chick can stand a lot of trouble if it is well supplied with ozone, and ozone is absolutely essential to the making of good blood,—to making good growth. We spoke above of the successful chicken raiser who makes it a practice to have the heat of his brooders a bit higher than the age of the chick makes necessary in order that he may raise the lid of the brooder an eighth or quarter of an inch, or open the ventilator slides a little more, or in other ways supply currents of fresh, outside air. Contrast his method with that of chicken raisers who in mistaken kindness cover the brooder with burlap sacks or a horse blanket at night to "keep the heat in." Such do not realize that in keeping the heat in they are also keeping the air in, to be breathed over and over again. And it is no wonder that the chicks come out of such a brooder in the morning weak and trembly. Some brooders are so constructed that the ventilators cannot be absolutely tight-shut. Indeed, in one popular make of brooder we advised the manufacturer to provide holes for ventilation close up to the top under the hover, and make a slide with corresponding



51—THE FATTENING CRATES

The frame of the crate is six feet long, sixteen inches wide and twenty inches high. It is built from seven-eighths by two-inch dressed lumber, and is divided by two tight wooden partitions into three compartments. Each compartment holds four chickens. Ground oats, finely ground, or with the coarser hulls sifted out, form the basis of all food mixtures.

holes through it, with a knob and wire connection to the slide so that it could be operated from outside, and a catch so set that when the slide was pulled a certain distance it was checked, and there were one-eighth inch apertures through all of the holes on each side.

This device positively prevented the ventilator being fully closed. The operator who did not get on to the device would think he had wholly closed the ventilators, but there were still some air inlets and outlets remaining. Brooders should be well out daily and opened up to the sun every day; the hovers being turned up and exposed to the sun and air also. There are stormy days, of course, when such sunning and airing is impossible; it is all the more imperative that the sunning and airing be done when possible, on warm, sunny days. Note again the quotation above from the bulletin of the Rhode Island Experiment Stations which says: "Sunlight is the best and cheapest germicide for the tubercle bacillus." It is not only the cheapest

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and the best germicide for that germ, but for other disease germs, and it is a germicide which we should use as a preventive; if we use sunlight and fresh air freely we shall have very little trouble with disease germs.

OVERCROWDING

Just a word about overcrowding the chicks in the brooders; overcrowding is a prolific cause of disease and death in brooder chicks. We do not mean when they are babies; at that time two or three times as many chicks can be brooded together in one brooder as can be safely let run together three or four weeks later. As we said before, chicks double in size very quickly, and the brooder space which was large enough for the family of babies has become crowded quarters for practically the same number of chicks grown twice the size. What then shall we say when by the time the chicks are four or five weeks old they are four times as large as when first put in the brooder? Under these conditions the chicks are crowded together and the weaker ones get pushed down and are trampled or suffocated; many that do not actually die under these conditions have health impaired and are weaker for life. We know a poultryman who bought half a dozen brooders of a well-advertised make, and they brooded the chicks admirably for two or three weeks; then he began to find two or three and sometimes as many as five or six dead in a brooder in the morning; but not until he had actually lost by such overcrowding fully twenty-five per cent of the chicks entrusted to these brooders did he come to realize that he had twice too many chicks in them. Thus does nature revenge herself upon us. She has a way of "getting even" that furnishes sharp lessons sometimes, and we are wise if we give heed to her admonitions.

START WITH HOPPER FEEDING

UNDER PROPER CONDITIONS CHICKS MAY
BE HOPPER FED FROM THE START—GRIT,
CHARCOAL AND FRESH WATER NECESSARY

H. A. NOURSE

HOPPER feeding does not often begin with the first food fed to little chicks, but under favorable conditions it is successful from the start. Once in the last week of May, I took from a large incubator sixty-two chicks that were left after the stronger ones had been taken out. One had a crippled leg and two others were apparently of little account. They were in the incubator forty-eight hours after the hatch was finished and were placed in a brooder located in a house with a dirt floor. The floor of the brooder was six inches above that of the house and dirt was banked in to form an incline between them. Directly in front and five feet away was a full window which was never closed.

The chicks were placed in the brooder just before dark and a board set on edge near the hover to keep them from getting away from the warmth during the night. This was moved back a little next morning to allow the chicks to run about in front of the hover. About noon the first day this board was removed and a small hopper containing dry chick food was set about three feet from the brooder. A fountain of water was placed near it and a handful of fine grit was scattered about the pen. No attempt was made to drive the chicks to the

food, but when they began to crowd together outside they were driven back to the brooder to get warm. Before the end of the first day they were eating from the hopper and it was afterwards refilled as often as was necessary. The brooder was kept clean, a fairly even temperature was maintained and plenty of finely granulated charcoal, grit and fresh water were always within reach of the chicks. After three days the chicks were given a small yard in front of the house.

At the end of three weeks, when we were obliged to abandon the experiment, sixty of those chicks were alive and had made rapid and vigorous growth.

HOPPER FEEDING HENS AND BROODS

At about the same time that the experiment explained above was tried hoppers containing two parts chick food and one part whole corn, well mixed, were placed in the coops of ten broody hens that had finished hatching the day before. Each of these hens had twelve chicks. These hoppers were never empty, fine grit, charcoal and fresh water were supplied and the coops frequently cleaned. Just at sundown on pleasant days the hens were let out to exercise.

The chicks made good growth and very few were lost. After a few days the little fellows began to eat the whole corn,



52—CONDITIONS FOR GOOD HEALTH

which was intended for the hens, and were often seen with their crops bulging with it. They seemed to digest the large kernels readily, for they lived and thrived.

At the end of two weeks wheat and cracked corn in equal parts were gradually substituted for the chick food in the hoppers and were continued in use until the chicks were weaned. This reduced the labor of caring for these broods to the minimum and the results were all in favor of the method.

Although the results of these experiments were very gratifying, I do not feel justified in giving the methods unqualified recommendation. Both were tried during warm and fairly dry weather when the chicks could spend most of their time in the open air on the green grass. Under equally favorable conditions as good results could always be obtained. But whether the same methods could be used successfully in cold weather, when the chicks are confined to pens in a brooding house, and have no exercise except that obtained by scratching in the litter, can best be ascertained by experiment. If hoppers can be used successfully under such conditions, it would save hundreds of dollars to operators of large brooding houses.

SUCCESSFUL CHICK GROWING

KEEP THE CHICKS GROWING—AN OUT-DOOR BROODER IN WINTER—HARDEN THE CHICKS GRADUALLY—SUNSHINE AND FRESH AIR—DRY FEEDING A FACTOR—HINTS FOR WEANING TIME—KEEP QUARTERS CLEAN—TABLE OF WEIGHTS, ETC.

P. T. WOODS, M. D.



ORDINARILY weaning time is a critical period in the life of small chicks, particularly those which are grown by artificial means. It is at this time and in the failure to properly lead up to it, that many beginners make fatal mistakes in the care and management of brooder chicks.

When brooder chicks are from six to eight weeks old, depending on the season, the weather and the development of the chickens, they should be ready to leave the brooder for colony coops, except in the case of mid-winter chickens, which of necessity must be kept in buildings warmed by artificial heat. Unless chickens are properly handled at weaning time there is liable to be a cessation of growth which means loss of time and many mean that the chick will fail to develop properly. Stunted, imperfect chicks and even increased mortality may result from errors at this time. If intended for breeders or profitable market stock, chicks must be kept growing all the time from the start; there must be no set-backs like "Standing still," with no apparent gain or temporary stops in growth. With a healthy normal chick you should be able to almost "see it grow," so continuous and rapid is the development.

A WEIGHT STANDARD TO GROW TO

In the following table are given the weights which it is possible to attain in growing chicks of the American class. These weights were actually attained with a flock of early hatched White Wyandotte chickens. While somewhat unusual and extraordinary, this schedule of growth represents actual development, and what has been done may be again accomplished. It is not to be expected that every flock of chicks can be kept up to this standard, but it is an end to work for, not an ideal, but an accomplished fact that it is perfectly possible for others to attain if they will strive hard for it.

TABLE OF ACTUAL WEIGHTS

The following weights were attained by a flock of seventeen White Wyandotte chicks in ten weeks:

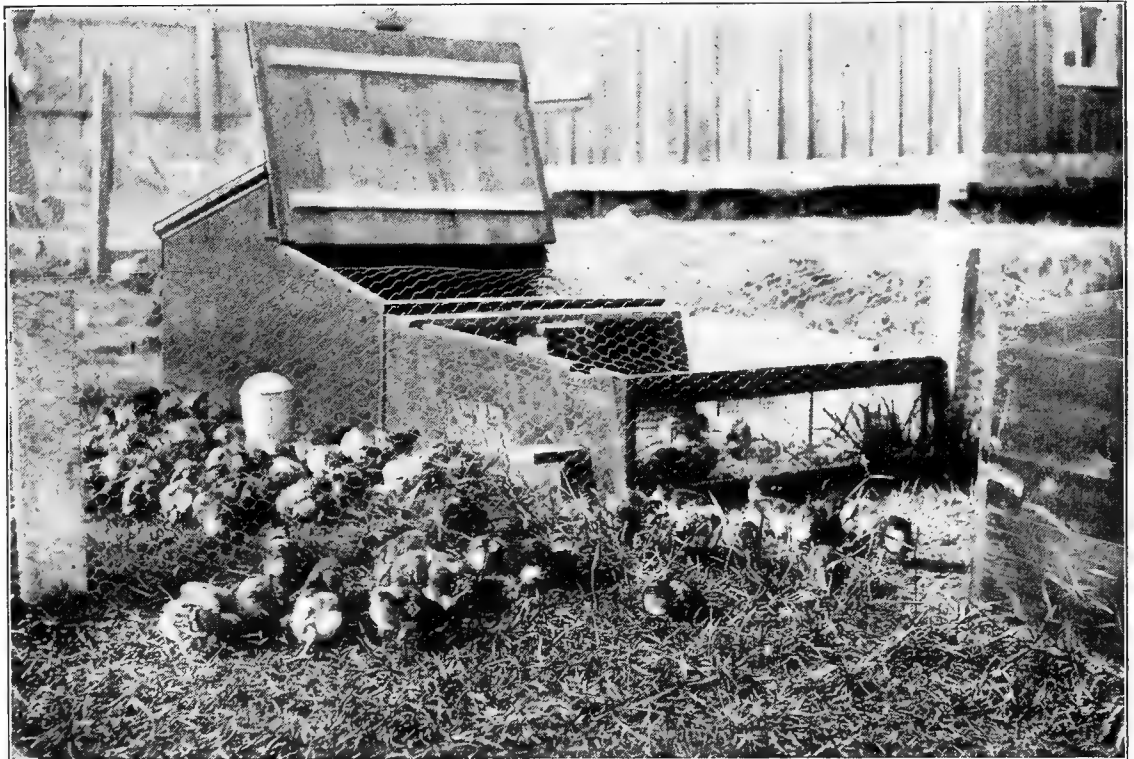
Weight of chick when newly hatched.....	2 ounces
Weight of chick when four days old.....	2 ounces
Weight of chick when ten days old.....	4 ounces
Weight of chick when three weeks old.....	8 ounces
Weight of chick when four weeks old.....	12 ounces
Weight of chick when eight weeks old.....	2 pounds
Weight of chick when ten weeks old.....	3 pounds

These weights represent the actual weights of several chicks selected as average representatives of the flock. A few of the birds ran a trifle under weight and several ran a little over weight, so that the above table may be accepted as a fair estimate of the entire flock.

Aside from the normal standing still which occurs in the first four days, these chicks grew continuously from the start; there were no set-backs. It has frequently been stated that "chicks are heirs to nothing but health and enjoyment of life, while the ills come from mismanagement." There is a deal of truth in this for it is the natural tendency of a healthy chick to grow and thrive.

CHICKS GROWING OUTDOORS IN WINTER

The writer has a flock of White Wyandotte chicks which are being grown in an outdoor brooder, which has been running out of door without shelter or protection from the weather since the middle of February. The weather has been stormy and very cold. Extreme changes have been frequent, the out-



53—AN OUT-DOOR BROODER IN OPERATION

door temperature ranging from 50 degrees above zero at noon on some days to zero on several nights, with only a few nights when it was warmer than 12 or 14 degrees above zero. On several occasions the wind has blown a gale of 60 miles or more an hour. Quantities of snow on the ground and only a little bare place in front of the brooder cleaned by shoveling. Yet these chicks have done remarkably well, they are covered with heavy down and are growing rapidly. The hover space is kept quite warm, several degrees higher than the brooder directions call for, in order to keep the apartment outside the hover

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sufficiently warm for comfort, but they get an abundance of pure fresh air to breathe. Every day when the sun shone, after they were a week old, these chicks have run out on the snow, ice and frozen bare ground in front of their brooder and in this way are becoming hardened; properly seasoned to be in fit condition for weaning time when it arrives. Every day after they were three days old, no matter what the weather was, the hover was removed for a few minutes to air it three or four times between daylight and dark. Dry grain chick food, the best cut clover, grit, charcoal and pure fresh water have been kept always before these chicks from the time they were placed in the brooder.

While running them in a small outdoor brooder out of doors in winter was begun chiefly to see what could be done, the results have been both interesting and pleasing thus far; the only disagreeable feature being the discomfort attendant on caring for a brooder out of doors in inclement winter weather. The chicks are but three weeks old at the present writing, are doing well and will soon need a rough packing-box, scratching shed shelter to afford an outdoor run in stormy weather.

This report of experience has taken us a little way out of the regular course of our article, but it is given to illustrate in a practical manner that small chicks are naturally hardy and are seldom as delicate as is popularly believed, unless we make them so.

It is by coddling, babying and otherwise mishandling chicks that we make them delicate. We are afraid to give them fresh air, afraid to open the brooders afraid to let the chicks be natural, forgetting that the mother hen in natural brooding has no such scruples and frequently rises from her brooding position, forcing her chicks to take exercise and fresh air whether they will or no. She hardens her chicks to frequent and sudden changes and at weaning time declines, in no uncertain manner, to permit them to hover. Having gradually outgrown their natural hover and having become hardened to abrupt changes, there is seldom any difficulty with hen-raised chicks at weaning time. There is no good reason why there should be any more trouble in weaning brooder chicks.

HARDEN THE CHICKS GRADUALLY

Lead up to weaning naturally and gradually. Let the change be a constant and almost imperceptible one from the start and there will be no trouble at weaning time. Begin, when the chicks are a few days old, to air out the hover chamber at frequent intervals and expose the under side of the hover to direct sunlight. Reduce the heat under the hover very gradually, but keep it warm enough to make the chicks comfortable. When operating a brooder in cold weather, keep the hover space warm enough so the chicks can warm up quickly. If you do this and care for the chicks properly, you will seldom find them under the hover in the day time. They run in out of the cold to warm up a bit and then run out again to scratch in the litter or play with their mates. Like all young things, healthy chicks are playful and get a liberal amount of exercise in this manner. If you doubt this, watch a flock of brooder chicks running with a bit of wood or other non-edible substance, watch them jump about and flap their tiny wings, and race in and out of the brooder in the sheer joy of a happy existence. If you keep your eyes open you will cease to be a "doubting Thomas" and find small chicks quite as playful as young kittens or other frisky young creatures.

AN OUT-DOOR RUN ESSENTIAL

Provide an outdoor run early, it will do them good even in winter to have a run outside on every fair day for a little while when the sun shines. On days when it is stormy, keep the chicks indoors, but supply an abundance of fresh air by opening the house windows and by keeping the brooder vents open.

Never wholly close the ventilators of your brooders. Close, dead air will kill more chicks than any other one cause. Fresh air is a life giver and a life saver, don't forget this. On windy or stormy days it may be necessary to close the vent on the windward side, but keep the apposite or lee side vent open. Whatever you do, air out the whole brooder daily, if only for a few minutes. Don't use a brooder which has a fixed or immovable hover. Sunlight under the hover kills germs and prevents sickness. The only way to get sunlight under the hover is to remove the hover board or metal and expose its under side and the inner side of the felts to sunshine and fresh air. If this is done every time the chicks are fed it will benefit the chicks and there will be no danger of chilling them.

IMPORTANCE OF SUNSHINE AND FRESH AIR

As long ago as in 1889 the Rhode Island State Agricultural Experiment Station issued the statement in its Bulletin No. 61 on the "Mortality of Brooder Chicks," that: "Sunlight is the best and cheapest germicide for the tubercle bacillus. We found that the simple expedient of removing the hovers and setting them out of doors in the full sun all day reduced the evidence



54—CANVASS SUN SHELTERS FOR COOPS

of tuberculosis in the post-mortem examinations from nearly 50 per cent. to only 3 per cent."

If fresh air and sunlight will work this wonderful change in a fatal malady like tubercular disease, it certainly can be counted on to prevent diseases of a less malignant nature. When brooding in cold weather we cannot always keep the hovers out all day. We can remove them for a little sunning and airing while feeding the chicks several times a day, and gradually work up to keeping them out all day as the chicks become gradually hardened, older, stronger and better able to do without artificial heat. Whatever else you may neglect, do not fail to supply Nature's best tonic and disease preventives, fresh air and sunlight (when it is available), in all parts of the brooder.

DRY FEEDING A FACTOR IN SUCCESS

I firmly believe that dry feeding is the most satisfactory and most successful method of feeding brooder chicks. Dry grain chick food of good quality, should be kept always before the birds. The brooders should be well littered with cut clover or chaff and some fine sand. Use sand and chaff half an inch deep on the floor beneath the hover. Keep pure beef scrap, good quality, green-cured, dry cut clover or alfalfa; granulated charcoal; chick-size grit and pure fresh water (with the chill

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off in cold weather) always before the chicks. They will not overeat, and fed in this manner there is no danger of their going without food when they need it. In addition to this, chick food should also be scattered in the litter. Fresh green food like grain sprouts, lettuce, split beets, or apples should be supplied frequently. Give them a grass run as soon as possible after they are a week or ten days old, and in any case provide an outdoor run, giving them a chance to use it during the sunny part of every fair day.

Cared for in this manner the chicks will grow sturdy and thrive like hardy weeds; they will be always plump and in good condition.

HINTS FOR WEANING TIME

Gradually reduce the temperature in the brooder until 75 to 65 degrees is reached; then on mild nights accustom the

sheltered position, preferably in an orchard beneath a good sized tree, and move the chicks to it in the morning of a pleasant day. Place a small wire enclosed run about 6 by 10 feet in front of the house and keep the chicks confined for a few days until they become used to their home. Bed the floor of the house with a little sand and an inch or more of chaff, cut straw or similar litter. Run this house with the cloth hood closed at night at first; as the chicks grow and the weather becomes warmer the hood may be left up on mild nights and finally kept open all the time.

Do not put more than 50 chicks in one flock at weaning time, and when they are ten or twelve weeks old, thin the flocks down to 25 in a colony coop.

KEEP QUARTERS CLEAN

Keep the chicks' quarters clean; if they are confined to small runs remove to new runs often, always plowing up and disinfecting the old ground from which the chicks were moved. Airlaked lime (if thoroughly slaked) will answer for disinfection if a good top dressing of it is given before plowing under. It will be well to plant these old runs to rye or oats to sweeten the soil and afford green food for fresh crops of chicks.

The colony house should be cleaned at least once a week and kept clean, renewing the sand and litter often. In these houses use a creolin disinfectant or a good lice paint at frequent intervals. Take the roofs off and sun and air the coops often. A little hot whitewash applied to the interior in the early morning of a bright sunny day, and a thorough drying out afterward, is an excellent means of sweetening the coops. Don't let the chicks get lousy. If lice appear use a lice paint on the woodwork and a good lice powder on the birds.

When the chicks are a little more than half grown put roosts into the coops for them. If they are healthy, well-fed and well-nourished you need not fear crooked breast bones. Provide shade and shelter for the birds to run

to in hot or stormy weather, but don't neglect to make the proper use of Nature's best remedies, sunshine and fresh air.



55—CONTINUOUS OPEN FRONT BROODER HOUSE

chicks to going without artificial heat until you are able to do without the lamp altogether. When the chicks are from six to eight weeks old they should be well feathered and well grown. At this time if they have been hardened properly, and gradually used to doing without artificial heat, they are ready to be transferred to the colony coops. These should be shed roofed box coops of about 3 by 6 feet floor capacity; 3 feet high in front and 2 feet high in the rear; the roof should be removable. The front should be boarded up at the bottom for a little more than half the height; the balance of the front should be wire netting and provided with a framed hood on which is stretched waterproof muslin or close-woven burlap. This hood should be hinged at the top to swing outward and held in position by wooden ratchets. The hood when closed should cover the whole wire front. Provide a large door in the center of the front and in the bottom of this make a small opening, for a chick door, provided with a slide to close it. The floor of this coop should be wood, kept off the ground by one inch cleats. In such a colony coop the chicks may be safely kept from weaning time until well grown and ready for the larger houses.

After the chicks have become accustomed to doing without artificial heat, place one of these portable colony houses in a

SOUND, PRACTICAL METHODS

METHODS EMPLOYED ON ONE OF THE BEST AND MOST SUCCESSFUL POULTRY FARMS IN AMERICA—MUCH TOLD IN LITTLE SPACE

H. J. BLANCHARD

OUR White Leghorns have been hatched and reared in large numbers continuously for many years by the artificial method, and we are satisfied it is by far the best and most profitable way. Some few breeders still maintain that artificially hatched and reared chicks do not make as large, vigorous birds, nor as good layers, but our experience is quite the reverse. Buy the best incubators and brooders you can get, even though the first cost is more; the cheap machines are usually 'made to sell' and would be dear as a gift. Run your machines a few days before using so as to become familiar with them and able to keep them well under

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control. At the end of the twenty-first day, after the hatch is done, open the incubator and remove the trays with the shells, unhatched eggs and dead chicks, if any; next open wide all ventilators and run the heat down to 98 or 100 degrees, leaving the chicks in without food or water until the next day. The brooders well littered with dry sand or finely cut straw in run and hover, should now show 95 to 100 degrees of heat under the hover. The chicks will now be strong, lively and in good condition to transfer to the brooder hover, which should be done without chilling them.

Feed very little the first day and give water with the chill off, using a good chick fountain. Be sure the chicks have some fine, hard, sharp grit with the first feed and always thereafter. What to feed is largely a matter of circumstances. We use a good commercial chick food exclusively for the first three or four weeks, and find it very satisfactory. After this we work in a little whole wheat and cracked corn, gradually leaving out the chick food.

BROODING AND FEEDING THE CHICKS

We use indoor brooders early in the season while yet cold, but later, when mild, use outdoor brooders. As soon as the chicks are strong enough and the weather is suitable, they should be got out doors on the grass in a little yard first, but when old enough, they should have free range all summer and until snow comes in fall. When chicks are about eight weeks old, we begin feeding once a day a mash of ground grain in which we mix a very little high-grade beef scrap, gradually increasing the quantity of meat.

Always keep fresh water in shade where the chicks can help themselves to it at any time.

We believe in the colony house plan for both chicks and old fowls, and free range for breeding stock so far as possible. We have colony houses for chicks near our corn fields and one near a half-acre blackberry patch, and find the shade and protection afforded by these crops very valuable to our growing chicks, and the crops and soil are also benefited by the foraging birds.

One line of our breeding birds has houses in a small wooded valley through which flows a brook, making a typical place for the birds to roam at will. From stock kept in such a manner, you will not fail to get strongly fertile eggs and chickens of sturdy frame and robust constitution.

The cull pullets and hens can be confined in large yards, planted with fruit trees of any kind or blackberry bushes, of which we find "Snyders" the best all-round variety. We annu-

ally gather good crops of blackberries and tree fruits from our poultry yards, while the trees and bushes make the yards seem more like free range and the confined fowls do much better than in the ordinary small, bare yards.

The best mangel wurzels are the Golden Giant Intermediate, and we grow them as follows: Select a clean piece of ground and plow under a heavy dressing of stable or hen manure, harrow very thoroughly and remove all rubbish, broadcast on a good dressing of commercial fertilizer and harrow in. Mark out rows three feet apart, sow seed in drills, about twelve pounds to the acre, and cover about one inch. Soon as the plants are large enough (about one inch high) thin out to a foot apart in the row, then cultivate, hoe and keep clean. The roots should be gathered before any hard freezing and stored in bins or piles in a cool cellar.

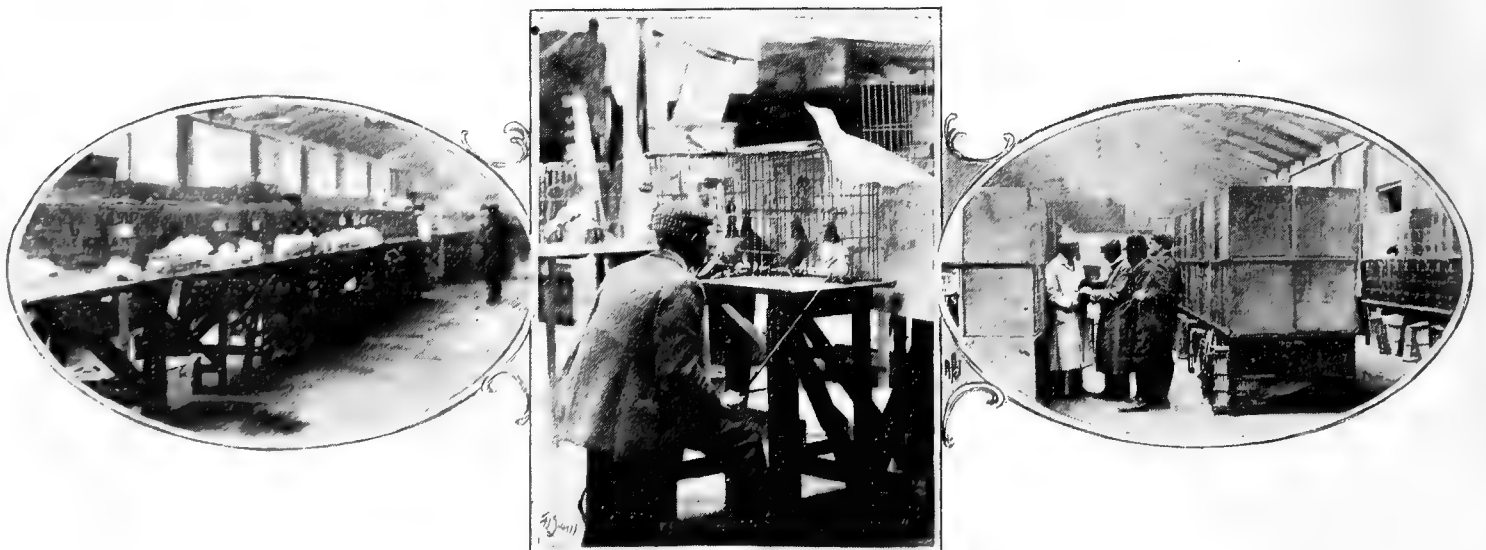
We never store the hen manure as it is a costly job to "fix" the nitrogen and pulverize the manure. It is drawn directly from the poultry houses to the fields and spread, winter and summer, and gives grand results with all crops except potatoes, which it is liable to scab.

BEFORE WINTER CLOSES IN

When snow comes our chickens are taken from the colony houses in the field and put in warmer winter quarters. During fall and early winter we dispose of a large share of our hens for breeding, laying or exhibition, thus making room for the pullets.

The cockerels are separated from the pullets about August and given free range on another part of the farm. They are kept in warm houses in winter that no combs may be frozen. Our best cockerels go in our own breeding pens or are sold for breeding or exhibition, and a great many of our pullets are sold and shipped all over the country. Sales of eggs for hatching also help swell the income. Market eggs was our first object and our plant was built up largely from the profits on their sale. When producing in large quantities we went to New York City and after some difficulty succeeding in placing our output at a good margin above regular market prices. Every egg must be new-laid, clean, of good size, neatly and securely packed to hold such trade, and you must have eggs in fall and winter.

Nothing desirable comes without earnest endeavor, and the poultryman must expect to work hard and have for his motto, "Eternal vigilance is the price of success."



FEEDING, HOUSING AND REARING

A COMPLETE COLLECTION OF QUESTIONS AND ANSWERS BY FOUR WELL-KNOWN EXPERT BREEDERS UPON THE SUBJECTS OF FEEDING, HOUSING AND REARING FROM HATCHING TIME TO MATURITY—COMPRISING VALUABLE INFORMATION.



AS IDENTICAL questions were asked the four breeders referred to, we will simply state the question once, then follow with the replies of each correspondent opposite his respective name. This will be advantageous to our readers, as they will be able to compare easily the different methods employed. These contributions are proof that while feeding methods may be similar, there is no cut and dried plan that can truly be deemed the best.

Q. 1. What do you feed your laying and breeding stock?

C. S. Green—Whole wheat, cracked corn, buckwheat, oats, wheat middlings, wheat bran, hominy, linseed oil meal, beef scrap, mangle wurzels, cut clover or alfalfa. Grit, oyster shells and fresh water are constantly before them.

G. A. McFetridge—Morning feed consists of cracked corn scattered in straw; night feed one part cut clover, two parts meal, two parts middlings, one part scrap, one-half part flour, some crushed shell. For "greens" cabbage, potatoes, turnips,

wheat, oats and cracked corn fed on alternate days, not mixed, and one feed of mash. In winter the grain is fed before light in the litter—straw—to induce scratching, with a light sprinkling at noon on cold days, and mash at night. In summer reverse.

Q. 2. Do you feed mash?

C. S. Green—Yes.

Q. 3. What is the composition of your mash?

C. S. Green—One hundred pounds wheat bran, 100 pounds wheat middlings, 50 pounds linseed oil meal, 50 pounds hominy meal and 75 pounds beef scrap.

H. A. Nourse—The mash is made of wheat bran, corn meal, middlings, clover meal and beef scrap. The whole grain ration is never varied, but the proportions in the mash are varied according to the needs of the fowls.

Q. 4. What and how do you feed small chicks the first week?

C. S. Green—The first two days they are fed wheat bread moistened with milk and fed every two hours. Grit, granulated charcoal and water are kept by them constantly after the first feed. From the third to the eighth days johnnycake is gradually substituted for the wheat bread, but is fed only three times a day, alternating in addition cracked corn, cracked wheat and millet seed either mixed or fed separately in very light litter on the floor. The johnnycake is made of five parts corn meal, one part wheat middlings and one-half part beef scrap with a little soda mixed stiff with sour milk and steamed until thoroughly cooked. This is fed cool, not hot. During this time they are fed six times a day.

G. A. McFetridge—I don't remove chicks until the twenty-second day; then I feed only once a day and give free access to water slightly warmed. The mash consists of equal parts of corn meal, middlings, and bran with flour enough to stick it together.

U. R. Fishel—I have found the best food for small chicks is cracked wheat for the first week; in fact, I have reared whole broods with wheat alone until nearly feathered out. Millet is good for chicks, but I find it will kill them if fed liberally at early stages. Oats, both rolled and pin-head, are good, but cause bowel trouble if fed to excess.

H. A. Nourse—Millet is fed in the litter, just enough to make them scratch, but the principal ration is a cake made of two parts bran, one part sifted corn meal and a little beef scrap and fine grit sprinkled in, baked hard and dry and fed in crumbs on tin plates, which are frequently scalded.

Q. 5. What is the ration after the first week and how fed?

C. S. Green—During the next five weeks the chicks are fed johnnycake (made as described) three times a day, at 7 a. m., 11 a. m. and 3 p. m. It is very important that they be fed the same time every day. When the weather will permit of free outdoor range whole and cracked grain suitable to the size of the chicks is kept before them in hoppers, but when they are confined the grain is scattered in litter on the floor and practically kept by them all the time; that is, they can find some grain by scratching on the floor. Wheat, cracked corn, millet seed, or buckwheat can be used, changing frequently. After the chicks are six weeks old they are fed mash twice a day (mixed same as for hens) and cracked or whole corn and wheat are kept before them in hoppers.



56—A PROFITABLE COMBINATION

For winter feed plenty of greens; when spring comes feed rye, wheat and corn in the green state; cut it short.

U. R. Fishel—Wheat, oats, corn, and two or three times a week a mash of one-third corn meal, balance wheat bran. Sometimes I add clover meal, and occasionally use as a tonic cayenne pepper in small quantities. I also feed sparingly of green cut bone.

H. A. Nourse—I feed one feed each day of whole grain—

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G. A. McFetridge—After the first week I feed three parts of bran, one part of meal, one-half part beef scrap, some green cut wheat or rye and mix with it enough flour to make it stick.

U. R. Fishel—After the first week we add to the ration pin-head oats, some millet and whole wheat. I always keep the chicks hungry and working. I have fed baked corn bread with good results.

H. A. Nourse—A mash made of two parts bran and one of corn meal with a little grit and five per cent beef scrap added, mixed with water or milk, is fed morning, noon, and night with a feed of cracked wheat and corn in mid-forenoon and mid-afternoon as an inducement to scratch.

Q. 6. Do you feed chicks intended for breeders and those intended for market differently and how?

C. S. Green—No.

G. A. McFetridge—I do not except when I fatten, then those intended for market are fed nearly clear corn meal for seven to ten days, not longer.

Q. 9. What do you use for green food?

C. S. Green—Mangel wurzels, alfalfa and cut clover.

U. R. Fishel—We have grass in all our yards. Also use some onions, clover, both cut and the meal, beets, cabbage and potatoes, almost anything in the vegetable line we can secure, cutting them with a vegetable cutter.

H. A. Nourse—In winter with no other green stuff available, I use chopped cabbage or add clover meal to the mash, but in warm weather I find lawn grass preferable.

Q. 10. Why do you prefer your plan? Does it save in labor in other expense?

C. S. Green—We consider it economical in both labor and cost of food, and it serves our purpose by using the food that is most available here. It also produces the best results of any method we have tried.

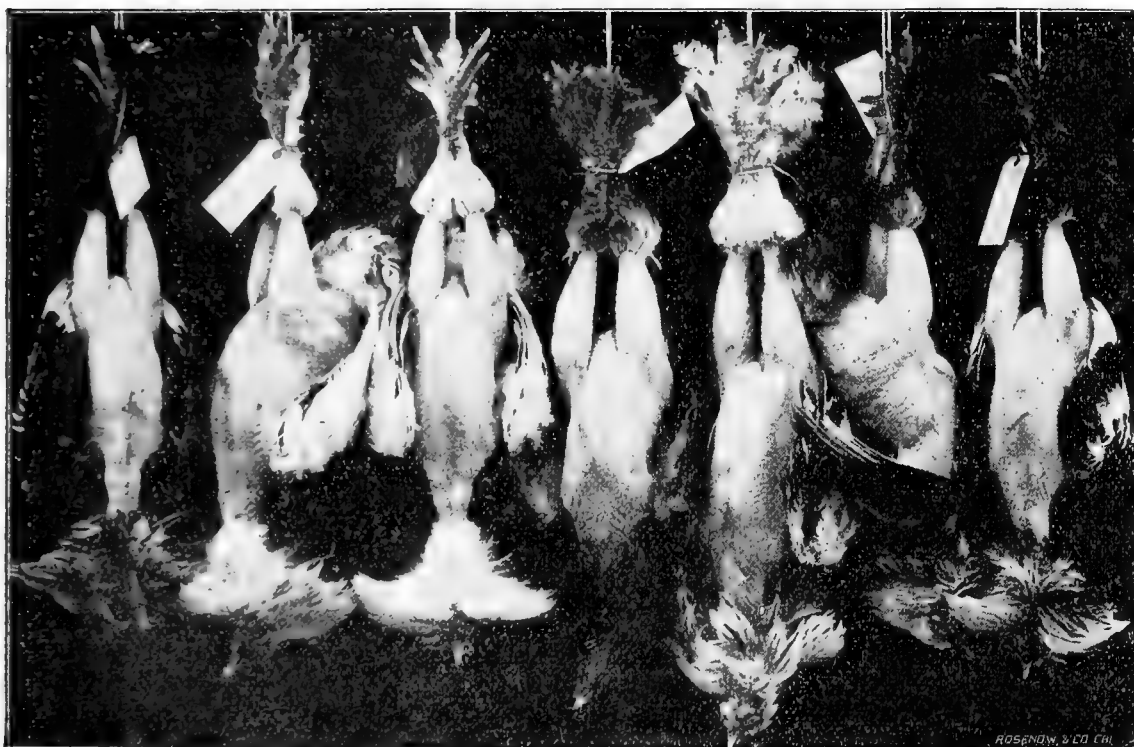
G. A. McFetridge—I find that my plan grows a large frame and makes a better broiler than when too fattening feed is fed while young.

U. R. Fishel—I prefer any plan that will benefit the poultry, making the saving of labor and time a secondary matter. The welfare of my poultry is the first thing considered by me.

H. A. Nourse—I prefer this method because I have had the greatest success with it.

Q. 11. Mention any points which occur to you tending to show benefit from your plan of feeding.

C. S. Green—This question, I suppose, relates to the method of feeding, which is as follows: The composition of the food is nearly the same in the winter as it is in the summer, except that less meat scrap is fed during the molting season, when the hens are idle, and an extra amount of corn is fed in cold weather. Whole



57—WELL FATTENED DRESSED POULTRY

U. R. Fishel—We rear nothing for market, as we have never been able to rear enough for our fancy trade.

H. A. Nourse—Just the same until time to fatten, when we feed to those intended for market a mash composed of three parts corn meal, one part bran, one part scrap and a little grit, in place of the mash described above.

Q. 7. Do you feed mash to chicks; if so, how is it made and how fed?

C. S. Green—Mash is fed in the morning and at noon after the chicks are six weeks old. We generally feed the same as we feed old hens, but sometimes mix in 100 pounds corn meal with the ration given the hens. We never give them all the mash they will eat, but govern it so they will be still hungry.

U. R. Fishel—I never feed mash to chicks until they are well feathered and then it is made up of green cut bone, bone meal, wheat bran, and clover meal. It is a good idea to feed mash to young stock whenever they tire of grain and seem to stop growing.

Q. 8. What results do you get?

C. S. Green—Pullets hatched March 1st began to lay this year July 24th, and cockerels are ready for market at twelve to fourteen weeks old.

U. R. Fishel—Excellent.

wheat, cracked corn, oats and buckwheat all mixed together or one at a time, alternating with the others, is fed in a litter about six inches deep as soon as the fowls can see to eat. At 10 a. m. the mash is fed, care being taken not to feed more than about three-fourths as much as they will eat. At noon all the green food is given them that they will eat up clean, and at night they are fed the same as in the morning. We find this a good ration for eggs in the winter. We are very careful not to change the ration except perhaps twice a year, fall and spring. As soon as the fowls can be given free range they are only fed twice a day. Morning feed is the same as in winter and the mash is fed at night all summer. An occasional feed of green cut bone when it can be procured is very good, even better than beef scrap. Boiled vegetables and refuse beef from the butchers boiled and mixed with the mash is relished very much.

G. A. McFetridge—While fed as stated, it is a good plan once in a while to leave out the mash and feed a mixture of cracked wheat, cracked corn and either rolled or pin head oats, equal parts, and the first time they refuse to eat give them nothing for the balance of the day.

U. R. Fishel—Good, healthy, strong, vigorous chicks maturing into breeders that give the best results in breeding yards.

ARTIFICIAL BROODING

H. A. Nourse—I have tried various other methods advised, but find the above about as easy, cheap, and as successful as any.

Q. 12. Do you use incubators and brooders and why?

C. S. Green—Yes; because we cannot find time to raise chickens with hens.

G. A. McFetridge—I use them because they are far superior to hens for hatching.

U. R. Fishel—I use incubators and brooders, for the reason that the hens cannot be depended upon. The machines are always ready and never leave the nest. If the brooders were as nearly perfect as the incubators we would not lose so many chicks. If every one would place in the brooders just about one-third the number of chicks the manufacturers claim the brooders will hold they would have greater success.

H. A. Nourse—I use incubators and brooders for market poultry because I have found it impracticable to hatch and rear large numbers with hens, if not indeed impossible in the early season.

Q. 13. Are artificially hatched and raised birds as good as those reared by the "natural method?"

C. S. Green—Yes. The fact of their being artificially hatched and raised will not detract from their worth one cent. Crowding one hundred chicks into a brooder where forty belong is the cause for the delusion that artificially hatched and raised chicks are inferior to those reared by the natural method.

G. A. McFetridge—Either chicks or ducks hatched and reared artificially grow faster and are free from head lice.

U. R. Fishel—Better.—I have reared larger, stronger birds by artificial means than the hen can rear.

H. A. Nourse—I can discern no difference, provided the same conditions of range, food, and exercise are secured for the growing chicks.

Q. 14. How do they differ, if at all?

C. S. Green—We can see no difference, except that the brooder chicks are free from lice, and are raised with much less mortality than those with hens.

H. A. Nourse—When those artificially hatched are confined in small yards they do not, as a rule, make as good stock birds, but rather better broilers.

Q. 15. Have you any particular method of brooding and what are its advantages?

C. S. Green—Yes. We use individual brooders which have both top and bottom heat. Each brooder is set in a colony house six feet square and contains about fifty chicks. The colony houses are placed about one hundred feet apart. This makes it possible to give the growing birds free range without intense crowding. They have a chance to get all the green food they require, and it saves the cost and bother of fences, thus reducing the labor to a minimum as nearly as possible.

G. A. McFetridge—My method of brooding is with a pipe system in a brooder house. I run the heat so that the return pipes near the stove register 100 to 110 F. with bulb in the returning water. This I find is the right heat.

U. R. Fishel—We take our chicks from the machine and place them in the brooder, which is placed in a small yard. As the chicks grow they are moved to larger yards. After they are feathered they are taken from the brooders and placed in colony coops, with window sash and glass placed in front of same. These coops are made of pine boxes which we get of the dry goods stores. From these boxes they are moved to colony coops made of piano boxes and placed at different points on the farm, allowing the chickens free range.

H. A. Nourse—I use and prefer individual indoor brooders for young chicks, and the overhead pipe system after two weeks. I believe that the chicks make a better start in the separate brooders because of better ventilation and slightly warmed floor, while the older ones seem to do better on a cool floor with the heat above.

Q. 16. How do you keep your runs and yards clean and avoid so-called "poisoning of the ground" by fowls using the same runs year after year?

C. S. Green—We give all fowls and chicks free range, occasionally plowing the ground around the buildings.

G. A. McFetridge—Either plow or dig the ground and sow to wheat or rye, or scrape off the top and add new soil or sand.

U. R. Fishel—Each yard for the old fowls contains one acre in grass, while the young birds are placed at different points on the one hundred and twenty acres of the farm, so there is no poisoning of the ground. The grass absorbs all such matter, as do the growing crops.

H. A. Nourse—The soil here at Fisher's Island Farm is very sandy and is thoroughly purified by heavy rains which we have in the fall and spring and which carry all foul matter into the earth.

Q. 17. How do you house and yard fowls and why?

C. S. Green—The fowls are housed in winter, in houses about fifteen feet wide, nine feet high in front and five feet high in back, with a single pitch roof, and it faces the south. It is divided into pens fifteen feet square, each pen containing about fifty laying hens. Every forty-five feet there is a solid partition to prevent draughts. The sides of the roof are stuffed with straw four inches thick, which keeps the house free from dampness. The front of each pen contains two window sashes, each sash containing twelve lights of 9 by 12 inch glass. This gives plenty of light without so much glass as to make the house exceedingly cold at night. We use cement floors because they are rat proof and will last indefinitely. They cost very little more than board floor when properly laid.

G. A. McFetridge—I yard pullets as soon as I can detect the sex, but prefer to give free range if possible.

U. R. Fishel—We use the colony plan, as it is the safest. No epidemic can go through your flock with the colony plan in use.

H. A. Nourse—In summer we use the colony plan only, with yards for each small house, and in winter both the long house and colony plan, with the odds in favor of the long houses, they being easier to care for, and fully as successful.

Q. 18. If you were to start over again with poultry how would you begin?

C. S. Green—I would buy eggs for hatching of the breed I liked best. I would also get the best eggs I could find of that breed, and set the eggs under hens the first year. The next year I would buy a first-class incubator, and four first-class brooders and "drive on." With this equipment and good houses, success would be practically assured.

G. A. McFetridge—The best and surest way to start in the poultry business, especially with limited capital, is to buy the eggs and work your way up. If sufficient funds are in hand buy stock.

U. R. Fishel—If breeding fancy poultry I would rather have three strictly high-class birds than a field full of ordinary ones. I would buy the best I could buy and would surely buy of a specialty breeder. I would then each season go back to the same breeder and get either eggs or new breeders, thereby getting the same line of blood and the good results of the breeder's matings and experience.

H. A. Nourse—I would begin slowly and build both plant and business along the lines indicated by prevailing conditions as the profitable ones.

Q. 19. What is the cost of keeping the hen a year?

C. S. Green—Ninety cents.

G. A. McFetridge—The cost of food for one year is about \$1.

U. R. Fishel—I can feed and care for a hen a year at an average of \$1 per hen, that is, in large numbers, say from five hundred to three thousand.

Q. 20. What is the amount of net profit that may be reasonably expected per hen per year?

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C. S. Green—It is reasonable to expect \$1 net profit per hen per year after paying the cost of feed.

G. A. McFetridge—The net profit should be at least \$2, the best I did was to produce \$300 worth of stock from thirty-six hens; of course, I sold quite a number at \$5 each.

U. R. Fishel—I never figured this out, as it is not as easily done on a fancy plant as on an egg or broiler plant.

Q. 21. How many hens can be profitably kept in one flock?

C. S. Green—Fifty.

G. A. McFetridge—It all depends on the range; four hundred Leghorns have done well in one flock on twenty acres.

U. R. Fishel—From ten to one hundred.

Q. 22. How many hens can one man care for and do well?

C. S. Green—Six hundred.

U. R. Fishel—Fifteen hundred to two thousand.

Q. 23. How many chicks should he raise each year without help?

C. S. Green—Eight hundred.

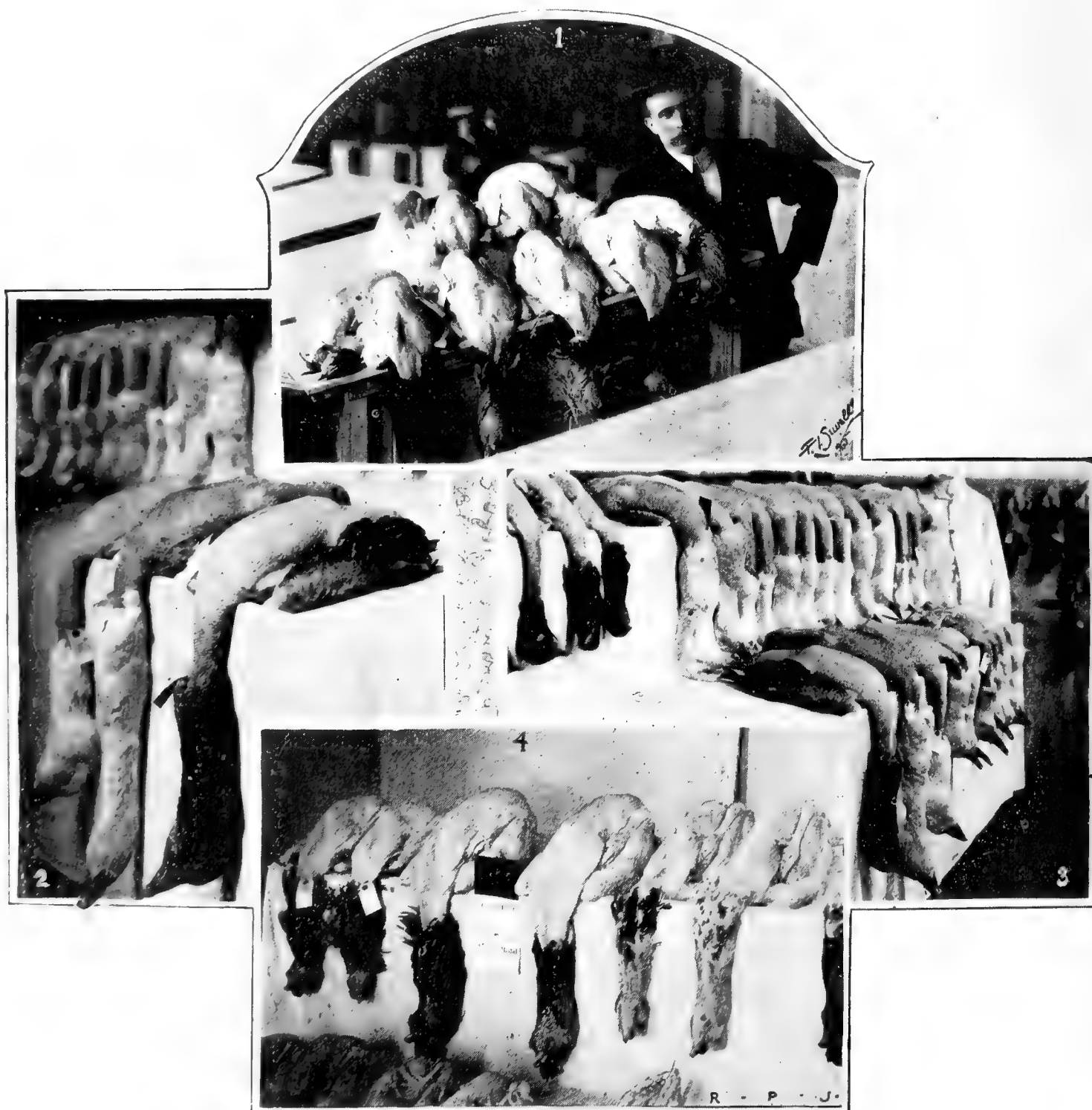
U. R. Fishel—Two thousand.

Q. 24. How many breeding hens are needed to pay a fair living?

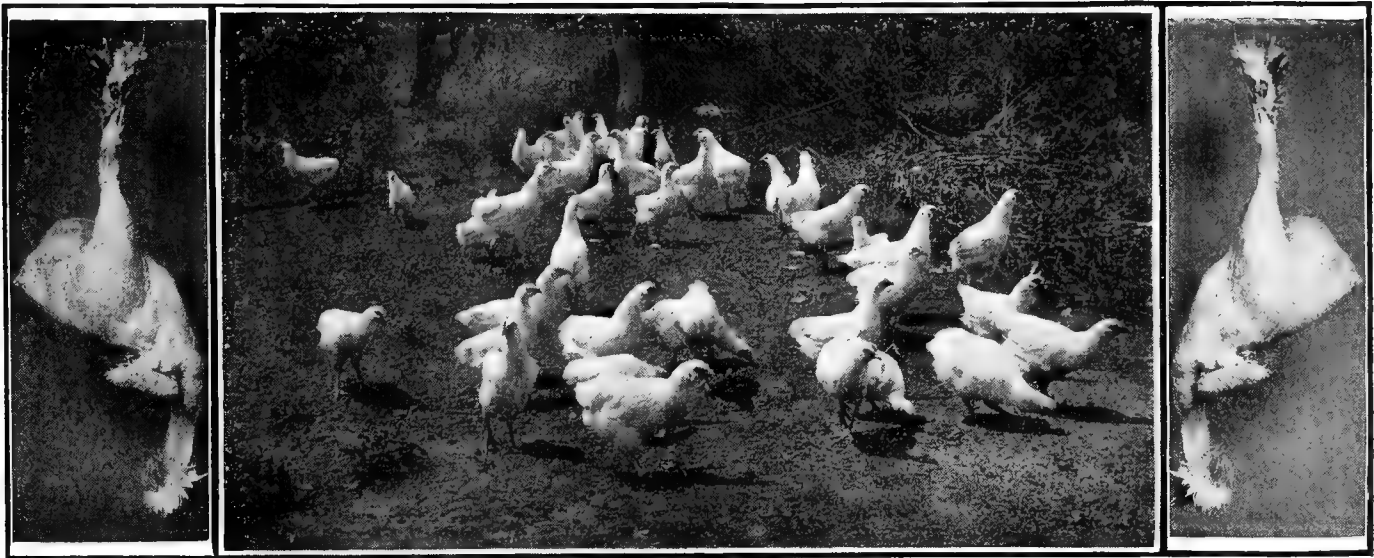
C. S. Green—Three hundred.

G. A. McFetridge—Four hundred.

U. R. Fishel—If for fancy, a flock of White Plymouth Rocks numbering one hundred will make a good living; while for market eggs and poultry a flock of five hundred to one thousand will make any man good money.



BROILERS



PROFITABLE BROILER RAISING

SUITABLE BREEDS FOR BROILERS—VIGOR AND SHAPE IN BREEDERS—SEASONS OF INCUBATION AND PRICES OF EGGS—PERIOD OF GROWTH TO MARKETABLE SIZE—SPECIAL FOOD AN AID TO GROWTH—CLUE TO PROFITS—CAREFUL WORK NEEDED

A. F. HUNTER

Mr. Hunter made an exhaustive study of this branch of poultry culture, collecting his facts from successful poultrymen in the section of the United States where broiler raising is conducted on the largest scale. Since the raising of broilers in profitable numbers, would be impossible without incubators and brooders or brooder houses, a work on Artificial Incubating and Brooding would not be complete without a chapter devoted to the subject of broilers.—Editor.

THERE are several interesting features manifest in different lines of poultry work, and not the least of them is the fascination of broiler raising for the beginners. That the promised profits of turning eggs into choice marketable fowls does greatly fascinate the beginner is well known to those who have studied conditions in the poultry business, and perhaps the most frequently recurring question coming to the poultry editor's desk relates to one point or another of broiler raising. Nor is this surprising when we consider that the changing of an egg into a chick is but a matter of three weeks' time, and the growth of the baby chick to a marketable broiler is but a matter of eight to twelve weeks' time. Somebody says: "An egg costs two or three cents, and in three months we can turn it into a two-pound broiler which will sell for a dollar." That certainly looks an easy way to make money. And it would be if every egg produced a chick and every chick grew to broiler size and good, marketable condition, and sold for fifty cents a pound; but, there are eggs and eggs, and there are broilers and broilers, and there are not a few difficulties in the way of realizing the profits which look so tempting. That there is a good profit in broiler raising there is ample evidence in the sections where market poultry is made a business, and where men have continued the raising of broilers and soft-roasters for ten, fifteen, twenty or more years. That many who embark in broiler raising gradually outgrow "the broiler stage" and develop into larger things is not surprising.

We have in mind several widely known poultrymen as examples of broiler (and market poultry) raising having been the stepping stone to the great poultry business they have built up.

There are great poultry farms where broiler raising is a considerable part, or even the chief part, of the work, and where incubators are kept running practically the year around. On others the broiler work is simply one feature of the general poultry work; the intention being to have a good crop of broilers to meet the high-priced market, and a succeeding crop of soft roasting chickens to meet the high-priced market for roasters, and a general "market poultry and eggs" business for all the year. There is still another class of broiler raisers, those who turn off their young cockerels to market just as soon as they are of marketable size, considering them simply a by-product of the general poultry work. The rapid fall in prices of broilers from the top market in April is partly due to the great quantity of surplus chicks marketed by the latter class, although some of it can doubtless be charged to the poor quality of many of the broilers thus thrown upon the market.

PRICES THEN GO DOWN

There is very little sale for broiler chicks in October, November and December, at least in the general market; some sale there is, to private trade, and in such case very little attention is paid to market quotations, the prices being simply between the grower and his customer. In January there is a light call for broiler chicks, which steadily increases through February and March and culminates in April, then gradually decreases through May, June and July, and by August the lowest prices are again reached. These lowest prices range from 12 to 20 cents a pound, and the highest prices range from 25 to 50 cents a pound, the sale price depending upon the quality of the product and the demand in the market. The chickens must be "gilt-edged" to command the highest figures, and if of extra

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fine, "gilt-edged" quality they not only sell quickly, but frequently command a premium above highest market prices.

These broilers are in greatest demand in April, with a good demand in March and May, and a moderate demand from August to New Year's. In the best markets, which are those of our greatest eastern cities, the prices range from about twenty cents a pound in January up to fifty cents a pound in April, then gradually falls off to about twenty cents again in August. Not all two-pound chickens, however, are "high-class" broilers and command the highest current prices; to command the highest prices they must be of "the best" quality, must be plump, full-breasted, yellow-skinned and fine-boned

(or disgusted) not a few broiler raisers, hence the importance of getting eggs from stock of the much desired fine-boned, plump-breasted, yellow-skinned class of fowls, to the end that, if fed right and cared for as they should be, they grow (and grow quickly) into broilers of the very best class.

EGGS FOR HATCHING BROILERS

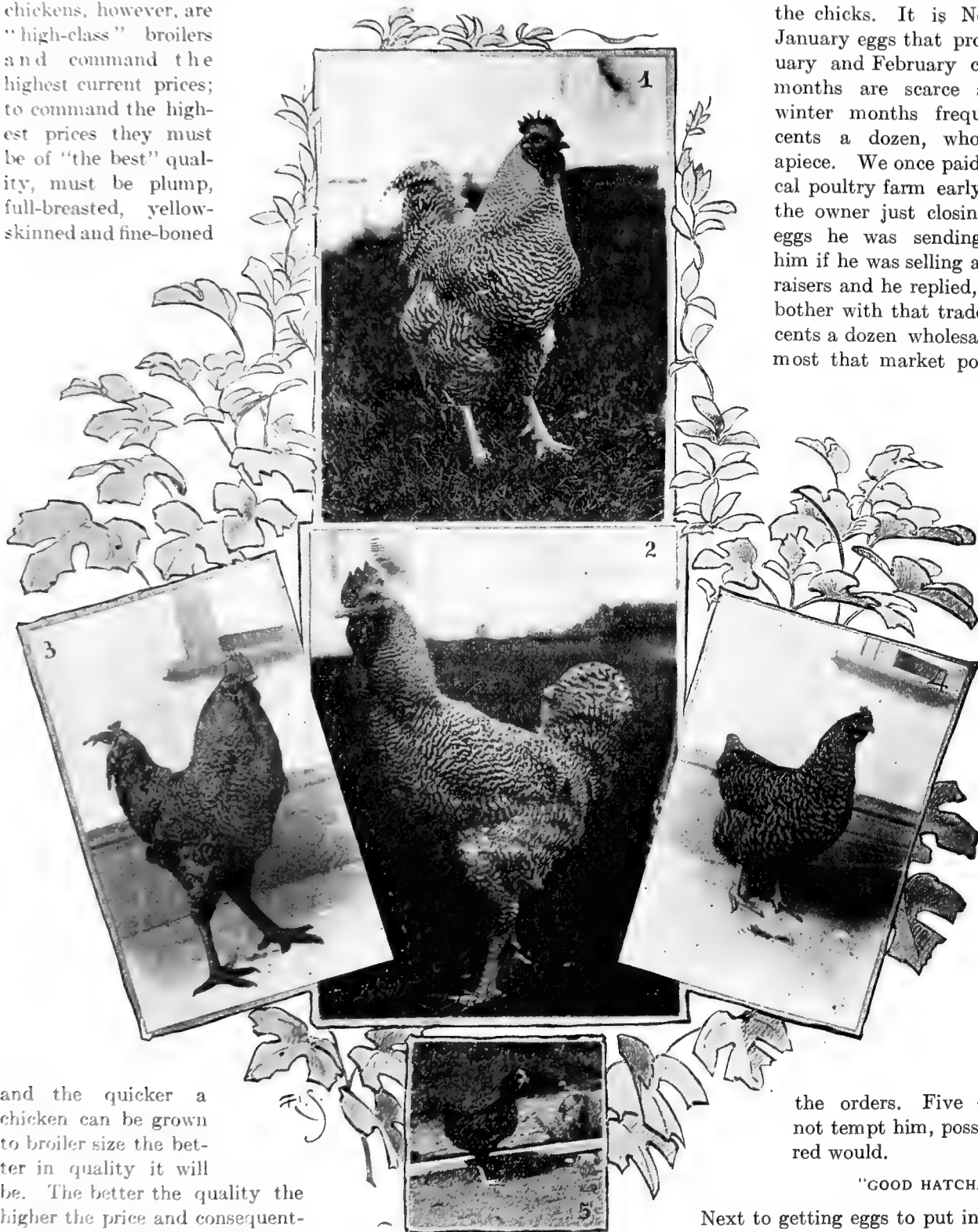
The first problem, and one of the most important to the broiler raiser, is the eggs from which to hatch the chicks. It is November, December and January eggs that produce the December, January and February chickens, and eggs in those months are scarce and high. Eggs in the winter months frequently sell at forty-five cents a dozen, wholesale; nearly four cents apiece. We once paid a visit to a large practical poultry farm early in December, and found the owner just closing a case of fine looking eggs he was sending to market. We asked him if he was selling any eggs to market poultry raisers and he replied, "No, sir! It don't pay to bother with that trade. I'm getting forty-five cents a dozen wholesale for these eggs, and the most that market poultry raisers will pay is

five dollars per hundred; that isn't difference enough to pay me for packing them to ship by express and pay for correspondence, time, etc., that it takes." As we had visited a market poultry raiser only a couple of days before, and he had exclaimed about the difficulty of getting good hatching eggs to fill his incubators, a comparison of the two differing points of view is interesting. The one man had the eggs in good supply, said he was getting a hundred and over a day, and could, no doubt ship five or six hundred eggs a week if the other would offer a price which would make it worth while taking care of

the orders. Five dollars per hundred did not tempt him, possibly six dollars per hundred would.

"GOOD HATCHABLE EGGS"

Next to getting eggs to put in the incubators the most important matter is the quality of the eggs, is the getting of good, strong-bodied eggs that will hatch out strong, vigorous chicks. Indeed, it may well be stated that the quality of the eggs is the most important point; it isn't an impossibility to get one for two or three thousand eggs, but to get eggs which will turn out a reasonable proportion of sturdy, "bound-to-live" chicks is more difficult. This brings us to "the hens behind the eggs," as it is impossible that eggs be in the best shape to hatch good chicks unless the hens that produce them are in high-condition.



58—TYPE OF UTILITY IN FOWLS

and the quicker a chicken can be grown to broiler size the better in quality it will be. The better the quality the higher the price and consequently better profit to the grower. If a two-pound broiler costs twelve and a half cents a pound to raise and is of such fine quality that it sells for forty or fifty cents a pound, there is a profit of twenty-seven and a half or thirty-seven and a half cents a pound; if, however, it is "off" in quality and sells for ten cents less per pound, there is but seventeen and a half or twenty-seven and a half cents a pound profit. This one point of poor quality and consequently lower price has discouraged

PROFITABLE BROILER RAISING

They must be in perfect health and be fed a food ration that supplies the elements of which good eggs are made. In addition to the food (which must include a sufficient supply of green food to "balance" the grain and animal foods), the fowls must be kept in clean quarters, must be kept free from vermin, must have an abundance of fresh air to breathe and must have sufficient exercise to keep the circulation active and promote good digestion. This looks formidable at first, but is really nothing more than common prudence dictates, because "the hen that lays is the hen that pays," and the hens must have good food and care if we expect them to lay.

The term "quality of the eggs" means much more than the average reader will realize. It is most important that eggs for market be of good quality, be strong bodied and full bodied; if less than this they are seconds or thirds and sell for a lower price. Of how much greater importance that they be strong-bodied and full-bodied if they are to be incubated. If weak and watery they cannot hatch good, strong chicks. There may be sufficient body to the egg to nourish the embryo to (and beyond) the critical period of exclusion, but the infant chick will be so weak and feeble it cannot "make-a-live" of it; or it may be still poorer and the embryo die in the last week of incubation; and some eggs are so poor the germs die in the first few days of incubation. When eggs are very poor in quality there will be many of these dead germs found in the incubator at the end of the hatch, or thrown out at the second test; it is perhaps unnecessary to say that such poor quality eggs are the most unprofitable and most unsatisfactory for the market poultry raiser to buy.

THE HENS THAT LAY THE EGGS

The witty "Autocrat of the Breakfast Table" said that the education of a child should begin twenty years before the child is born, and, similarly, the strength and vigor of our broiler chicks must be planned for one or two or more years before the eggs are laid from which the chicks are hatched. The laying hens must be birds with strong constitutions and themselves descended from birds that had strong constitutions.

How to get the desired strong constitution is an important consideration, and it is evident that we should both breed for it and "select" the breeding birds for it. Prof. Graham, of the Ontario Agricultural College, Guelph, has given much study to this subject, and in an excellent article has discussed the question of the constitution of the breeding stock, and illustrated his points with photographs from birds of both the desired and undesirable types. We have reproduced these illustrations on pages 76 and 78. Mr. Graham says:

"I am of the opinion that one of the most important points to be considered is constitution. This may have no actual market value, but it certainly has much to do with the bird's ability to grow and put on flesh. What we want is a good feeder and an economical producer. Generally, a bird with a short, stout, well curved beak, a broad head, not too long, and a bright, clear eye, will have plenty of constitution. Furthermore, I have noticed that when a bird has a long, narrow beak, a thin, long comb and head, and eye sunken in the head, it is lacking in constitution. It also has a narrow, long body, and in many cases legs which are long, and upon which the fowl seldom stands straight. There are some exceptions to these points, yet, upon the average, if a bird has a good head, the chances are favorable for a good body, and if a poor head, the opposite may be said. I have frequently noticed in Rose Comb breeds, such as Wyandottes, that you seldom see a good shaped one that has a long, narrow comb.

"The neck of the market fowl should be moderately short and stout, indicating vigor. The breast is the most important point in a market chicken. It should be broad, moderately deep; and, if fairly long, will present a fine appearance and appear well fleshed. It is quite possible that a broad, deep

breast will carry more meat than a moderately deep breast of the same width, yet there is no doubt but that the latter will present much the better appearance and thereby sell quicker, and at a higher price in the market.

"When considering the length of breast, we must try to get it to come well forward (see Ill. 1), and not cut off at an angle, as seen in Ill. 2. The body, in general, should present the appearance of an oblong, when the head, tail and neck are removed. We frequently see birds that are very flat in front and cut up behind as seen in Ill. 3. This class of chickens gives a very short breast; and if it happens to be deep, as it is in this bird, you will have, when dressed, about as poor a looking chicken as one could wish to see, there being a lack of width and length of breast, with excessive depth. (Notice the head is narrow and long, the body is narrow, the eye is bright, but slightly sunken, the legs are long and not straight under the body.) In Ill. 2, note the very flat breast, the length of back, the long neck and head, the narrow comb, the sunken eye, and the length of legs. The breast comes fairly well back, but not well forward. In Ill. 1 the bill is short and stout, but not as well curved as I should like. Note the breadth of the head, the prominence and brightness of the eye, the short and stout neck, the great width of the breast, the fullness caused largely by the breastbone extending well forward, the short, stout legs that are straight under the body, and the width between the legs. There is an expression about this chicken that impresses one as being the essence of vigor.

"The back should be broad to give lung and heart capacity, and, further, this width should extend well back to the tail-head. Avoid the wedge-shaped back as seen in some fowls that have great width at the shoulders and taper rapidly toward the tail-head.

"It is much easier to get good shaped market females than it is to get good cockerels. * * * The farmers have gone to raising big chickens and are asking for large, overgrown cockerels for breeders and, further, birds that have excessive depth. The result is, we get chickens when dressed weighing four to five pounds each that have immense, high breast-bones and very long legs. These are not attractive to the buyers and sell at a less price per pound than plumper birds. For example, if given two birds of the same width of breast, one is one and a half inches deeper in the breast than the other, the result will be, the one bird looks plump and sells readily, the other lacks plumpness and sells slowly. This can be bred out by using such males as Ill. 1.

"I wish to have birds as well built as we can get them. Ill. 1 is as near the ideal market chicken as I have seen in the breed he represents. The hen as seen in Ill. 4 is of a good market type. Note the width and fullness of breast. As a breeder she is a little fine in bone, and rather too small. She has, however, that blocky appearance that is desirable."

There has been far too great a use of big, coarse breeding males, the thought appearing to be that size (mere "bigness") indicated a strong constitution, and the note of warning sounded by Prof. Graham is most timely. In broiler chickens, too, fineness of bone is most important. The fineboned carcass gives a larger proportion of meat to bone (waste), and the coarser framed bird has the knife-edge breast, rather than the round, plump breast which has so attractive an appearance. Then, too, the finer boned birds take on fat more readily; it will generally be found that the birds which will not fatten and that it is seemingly impossible to get in good, marketable condition, are the long-legged, thin-bodied, angular birds begotten by the big, coarse ancestors which have come to be used because of this craze for mere "bigness!" If we will but take heed to the suggestions given us by Prof. Graham there will be a notable improvement in the "type" of bird we send to market; the improvement in type resulting in a bettering of quality,

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an increased price, quicker sales and better profits to the poultry-

PROPER BROODING HOUSES ESSENTIAL

I spoke of the remarkable attraction that broiler raising seemed to have for the beginners in poultry work, and to such the very great bettering of incubators and brooding and feeding comes as a great boon. The distressing failures, such as I have seen many of, should now be less common. One such, in a pleasant town about thirty miles west of Philadelphia, is worth citing as a warning. In this case two young men from the city had thought to better their pecuniary condition by broiler raising. They built a hot water pipe brooder house a hundred feet long, bought five hundred eggs and went to work. A friend with whom I was making an over-night visit told me of their poor success, and suggested that we drive over in the morning and see them. When we arrived we found them contemplating an incubator full of eggs which should have hatched the day before, and from which not one chick had come. Closing the shutters (the incubators were being run in the old farm house parlor), we tested about half the eggs, and told them they hadn't ventilated the incubator at all (apparently); had not put any moisture in the machine the 18th day, and, in addition to those handicaps, their eggs were only about half fertile, so they were only entitled to about 150 chickens anyway.

The air was "blue" there for a little while, but talking did no good, and while they in their lurid dreams had pictured a chicken hatching from every egg (in winter at that!), the potent fact was their work was a failure. They had already incubated over 2,000 eggs and hatched less than 300 chickens, and the brooder house showed at a glance the moment we entered it that no one could "raise" chickens in it. There was a "chill" in the air that went to the marrow, and chicks cannot possibly be grown in such an atmosphere. The brooder house had been built with half-dried lumber, after freezing weather came in the early winter, and to save fifty dollars or so a heater two sizes too small had been bought. There was no heat except the two flow and two return pipes under the hovers, and the hovers were close up against the partition along the walk.

Compare such a defective brooder house with the one in use at another farm which I also had the fortune to visit and which is in striking contrast. There is a brooder house equipped with abundant heating pipes under the hovers, having a bank of auxiliary heating pipes along the walk, to warm the house, and an adequate heater for the coldest weather. Then there is an electric regulator connected with a thermostat under one of the hovers, and which opens or closes the dampers as the temperature falls or rises from the point desired. Moreover, the hovers are not back against the walk partition, but out about three feet from it; there is no confined (dead) air under such hovers and no possibility of chicks crowding each other back against a back wall and smothering some.

Of course such a brooder house costs more than a cheaply built and inadequately heated one, but it "raises the chicks," and therefore pays the added cost over and over, instead of aiding to pass them along to the fertilizer heap.

MUST BE WELL HATCHED

Chicks to grow well must be well hatched. It is a serious handicap to the baby life to have great difficulty in getting out of the shell; sometimes the struggle for exclusion is so violent and exhausting that the chick has little chance of making a live of it. There are various causes for this, such as

too high or too low average temperature in the incubator, irregularity of temperature, and other eccentricities; poor eggs, owing to the laying stock being out of condition, is another potent cause. With the well made, up-to-date and well ventilated incubators of

to-day there is no reason for poorly hatched chicks if directions are closely followed, provided, of course, that the eggs are good and strong. The most important thing is that the right temperature be maintained in the incubator, and that it be steadily maintained. It is wiser to err upon the side of a bit too high temperature than letting it run low; it is the opinion of incubator operators that just a little too much is better than running the risk of the temperature going too low. This is especially true in winter hatching. As a general rule, the colder



59—HOW MARKET QUALIFICATIONS MAY BE TRANSMITTED

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the weather the stronger (or slightly higher) the average temperature should be.

RUNNING AN INCUBATOR

The daily task of running an incubator consists of turning the eggs twice a day, morning and night, and daily filling and trimming the lamp. Ordinarily the lamp trimming can best be done about the middle of the afternoon, in the interval between feeding the chicks and before the last feeding of the hens. About the seventh day the eggs should be tested, which is the simple operation of passing the eggs, with the large end up, before a testing light and noting if the egg contains a living germ. The germ is a dark (almost black), spider-like spot upon the side of the yolk, and the stronger and darker the germ appears the better. An egg which is absolutely clear is infertile, and should be saved out (to be eaten in omelettes or scrambled, or sold to the bake shop to be used in cooking.) Now and then a dead germ will be found, evidenced by reddish circles about the yolk or a generally cloudy appearance of the egg. These should be thrown in the manure pile, or may be fed to hogs.

After the test there will be fewer eggs left in the machine, but as each egg contains a life and life means animal heat, we may soon expect to note a slight increase in the temperature. This should be met by slightly turning down the nut on the regulator rod each day, or every other day, as the conditions seem to require. The directions sent out with each incubator are the guide to follow, and these directions say 103 degrees is the proper temperature to maintain. As we said above, we would err on the side of a bit more than the designated temperature, rather than fall below it. One of the most successful incubator operators of our acquaintance does not pretend to keep his machines at exactly 103. He says that atmospheric conditions vary, causing variations in temperature, and if he keeps between 101 and 105, with an average close to 103, he gets good hatches of strong, vigorous chicks.

An article written by Col. Roessell, formerly poultry editor of the "Country Gentleman," gives the following: "The guide which is most reliable in determining the progress of the hatch is the development of the air cell. This is a little space in the large end of the egg which is visible at testing time, and should continue to grow larger and larger until about the nineteenth day, when it occupies about one-fifth of the entire egg. Unless this air cell is developed correctly by the nineteenth day the chick cannot turn itself in the shell, hence sticks fast and dies, although it may be fully developed. The development of this air cell is the vital point to be considered in obtaining a first class hatch. It is controlled in two ways. If it develops slowly, which is usually the case, give the machine and eggs all the air you can. This can be done by opening the slides over the ventilators full width and cooling the eggs as long as possible each day. The cooling is best accomplished by placing the trays of eggs on top of the machine (closing the doors meanwhile), and leaving them there until the thermometer drops to 80 degrees, not lower. As the hatch progresses the eggs will stand more and more cooling."

This is excellent advice, and the novice will need especially to observe the last sentence; the novice usually errs upon the side of too little airing and cooling. It is sometimes better, in cold weather, to cool and air the eggs within the machine, leaving the doors open until the thermometer drops to about eighty degrees; and sometimes, in quite warm weather, it will be necessary to leave the eggs out several hours to get them cooled to about eighty degrees. No matter, not only is the exposure not harmful, but the fresh air strengthens the embryo chicks.

Most operators test the eggs a second time about the fifteenth day, testing out the dead germs and leaving in only the strong and vigorous germs. An expert operator can tell on the fifteenth day pretty nearly how many chicks he will get from

the hatch, so familiar does he become with the appearance and condition of the strong, vigorous embryo chicks.

When the first chicks begin to pip the shells close the ventilator slides almost wholly and keep the doors of the incubator closed until the hatch is well over; it is better to leave the machine entirely alone for the twenty-four to thirty-six hours during which the chicks are hatching. A good, strong heat, even up to 104 or 104½ is desirable at hatching time, as the chicks come out faster and better. When the hatch is well over open the ventilating slides again, to give the baby chicks more air, but do not take them from the incubator till twenty-four hours after the hatch is over.

BROODING AND FEEDING THE CHICKS

The temperature under the brooder hovers should be about 95 degrees at first, gradually lowering it to 90 degrees when the chicks are about a week old, and thus dropping about five degrees each week. An experienced chicken raiser says he wants the heat under the hovers to be 90 when the chicks are put in, and that their heat will bring the temperature up to about 95 degrees; lower it to 90 and by end of first week, 85 at end of second week, 80 at end of third week, 75 at end of fourth week, and so on. In such a brooder house as the one I have fully described above, the hover pipes are about three inches from the sand floor in the small pens next the heater, where the baby chicks are put. The space between pipes and floor gradually increases, until it is about eight inches at the end furthest from the heater, where the oldest chicks are brooded. It is the custom to move the chicks along as they increase in size, they being driven from pen to pen through a sliding gate in the partition between the pens.

One of the most successful broiler raisers of my acquaintance has smaller brooder houses (ten of them), each about sixty feet long, and the chicks are never moved from the pens in which they are first put until they are taken out to dress for market.

On another very successful broiler (and roaster) farm, in Massachusetts, they have entirely removed the hovers from the brooder pens, built up the sand floor an inch higher, and the chicks put their backs up against the warm pipes,—just as they do against the hen's body when brooded by a hen. It looks comical to see the chicks under and between the hover pipes, their tiny heads sticking above the pipes quite frequently. The people at the farm say they get better results since they removed the hovers, that the chicks grow better and faster.

FEEDING THE CHICKS

Feeding has been the stumbling block over which many a would-be broiler raiser has fallen. The dismal wail of "bowel trouble," usually caused by improper feeding (although too much or too little heat, or a "chill" may contribute) has marked the beginning of failure. Here is where the great gain in feeding methods has come in, of which we spoke at the outset and which has brought about what appears now to be a revolution. Instead of the mixed messes of meals, etc., the ready mixed chick foods, consisting of a large variety of seeds and grains, are fed; with the gratifying result of comparatively little infant mortality and a much more rapid growth.

We show here a table of the results obtained with White Wyandotte chicks of different ages, and the article describing them gave the following weights of the chicks:

Newly hatched chicks, per pair.....	4 ounces
Four days old chicks, per pair.....	4 ounces
Ten days old chicks, per pair.....	8 ounces
Three weeks old chicks, per pair.....	16 ounces
Four weeks old chicks, per pair.....	1½ pounds
Eight weeks old chicks, per pair.....	4 pounds
Ten weeks old chicks, per pair.....	6 pounds
Experienced broiler raisers expect to bring broiler chicks	

ARTIFICIAL INCUBATING AND BROODING

to two pounds weight (apiece) in ten to eleven weeks, and here we have eight weeks old chicks of full two pounds weight, and ten weeks old chicks weighing three pounds apiece. That difference of two to three weeks clipped off from the old time ten to eleven weeks considered necessary to grow a two-pound broiler makes a tremendous gain in profits. A saving of twenty to twenty-five per cent in time greatly increases the capacity of the brooder houses, as well as saves so much labor and food; and this in addition to the practical elimination of the vexing "bowel trouble" problem and the dreaded infant mortality. Assuming that the business paid a fair profit as formerly conducted, such a saving of time and labor will greatly increase the profits.

This most successful broiler raiser's method of feeding is worth quoting, by way of getting "a point of view." It was given as follows: "The chicks are fed five times a day on

missed is a step in growth lost. In a limited sense this is true, but a greater loss in growth comes from the chicks overeating and the appetite becoming cloyed. Not only does a careless feeder waste the food, but he puts the chicks out of condition and checks their growth by cloying them, by taking away their appetite. If food is left before them all the time they will actually eat less, and make a slower growth than if fed judiciously and kept a little bit hungry.

Another writer, describing the methods of a New Jersey broiler raiser, says: "At first the chicks are fed the infertile eggs, cooked, mixed with bread crumbs and rolled oats; then gradually corn meal and bran are added to the ration. After a hatch is off everything left in the incubators, shells, chicks that have failed to come out, whether fully grown or not, are all cooked up; equal parts of corn meal and bran, with about ten per cent of beef scraps are added and this mixture is used

to feed chicks that are two weeks old. It is said to make a perfectly wholesome food. The chicks are fed all they will eat three or four times a day.

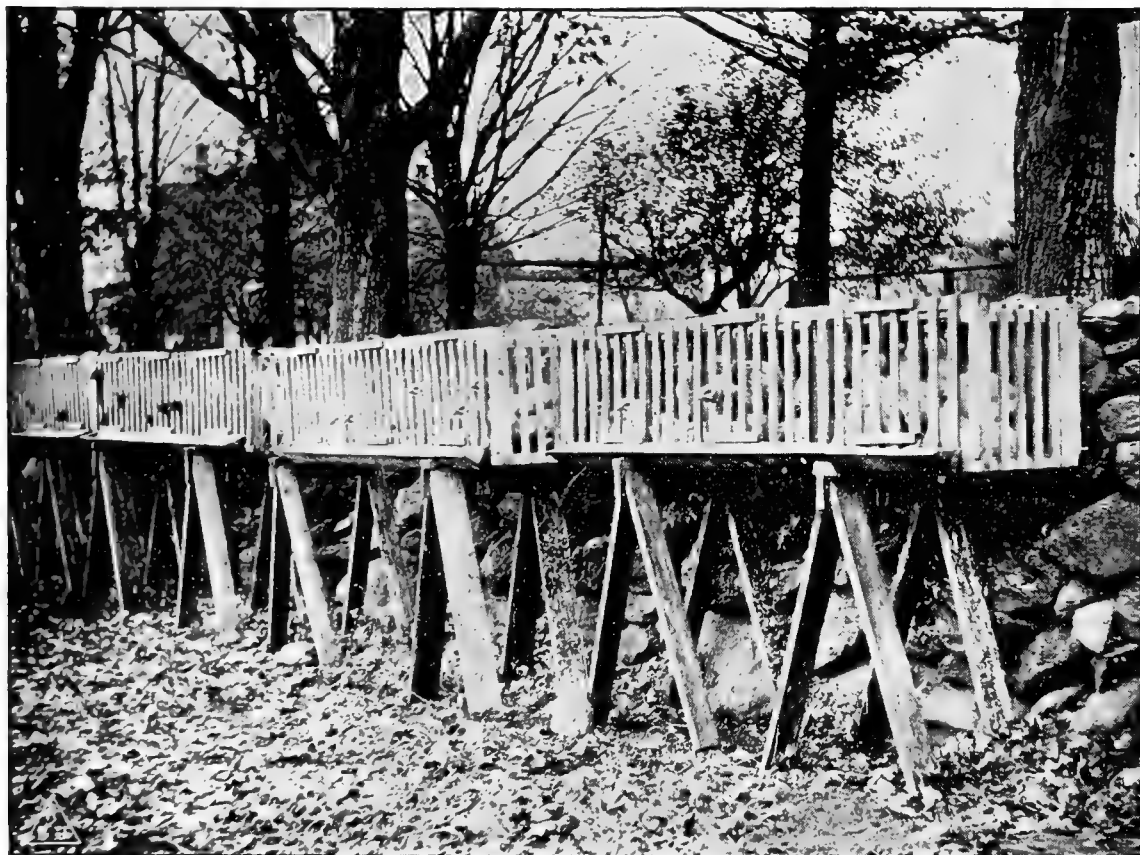
"Fattening these small birds is a difficult problem. The natural tendency is to make growth instead of laying on fat. For the last ten days before killing the ration consists of two parts corn meal, one part bran, about ten per cent cottonseed meal and from twenty-five to thirty per cent beef scraps. This seems like a heavy feeding of meat, and of course would not do for chicks that are to be raised to maturity. The proper weight for killing, twelve ounces, is reached at about six weeks; however, some reach that weight sooner than others."

This writer gives six weeks as the time of raising these twelve-ounce square broilers by that feeding method. The White Wyandotte chicks which are described here, and whose weights are

given above, grew to the same weight in exactly four weeks; a saving of thirty-three and a third per cent of time, brooder house room and labor. That saving would fully double the profits, and that saving is made by the improved method of feeding, by feeding a ready mixed ration of seeds and grains.

MARKETING THE BROILERS

Most broiler chickens are marketed "dry picked." This is partly due to the fact that the people educated up to appreciating fine broilers are critical, and the better appearance of the dry picked chicken both enhances its value and increases the consumptive demand. Most of the picking is done by professionals, who are paid so much apiece, and who go from one broiler plant to another as work is offered. The usual price paid for picking broilers is three to four cents apiece, and the picker engaged to pick them not infrequently employs "pinners" to assist him. He does the killing and "rough-picking," and passes the chicks on to the pinners to finish; the pin feathering and cleaning up requiring patience and nimble fingers.



60—CONVENIENT CRATES FOR FEEDING

hulled oats mostly, with a little cracked wheat and millet seed added. The cracked wheat is changed to whole wheat when they are about a week or ten days old, and cracked corn is fed after they are a week older, which brings them to three weeks of age. After this they are fed three times a day; a mash in the morning, wheat at noon and cracked corn at night, with a feed or cut fresh bone the middle of the afternoon. The mash is made of either corn meal or gluten meal, and wheat bran, with a ration of meat meal, light at first and more of it towards the "finishing off." Green food they get each afternoon, in the shape of lawn mower clippings when the grass is growing; later in the shape of rape. In winter finely cut clover is steamed and fed them."

Feeding, he claims, is the crucial point. Said he, "A careless or indifferent feeder will do more harm and waste more food than the profits amount to." The test of good feeding is to keep the chicks just a little hungry, and the best judgment of the feeder should be brought to bear. His rule is to give no food to a pen if there is any left uneaten from the last feeding. Many chick raisers mistakenly think that one feeding

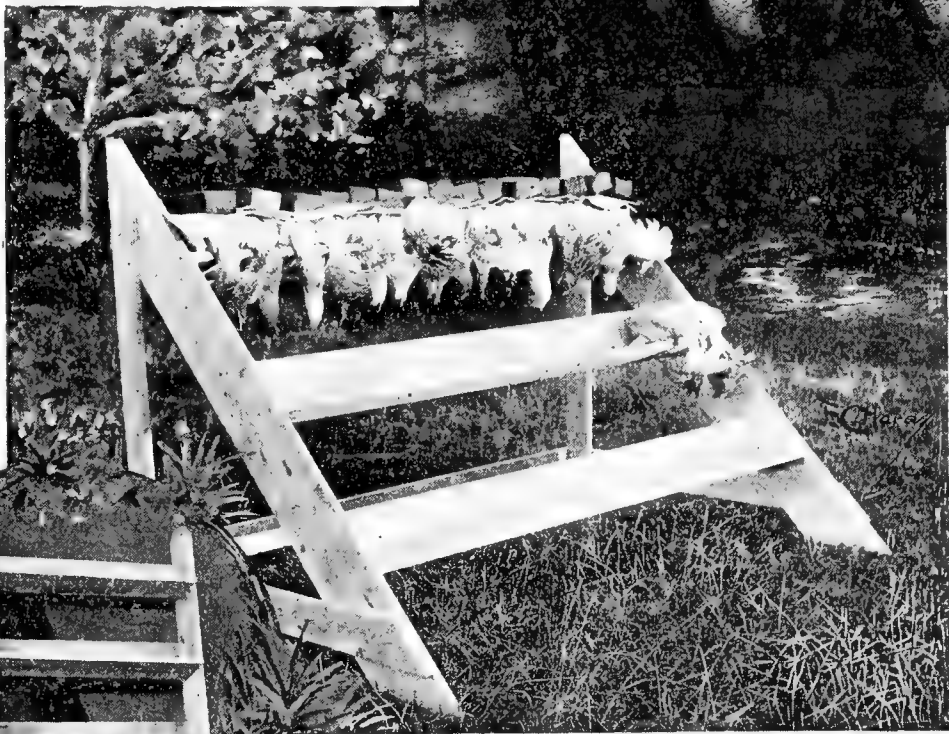
PROFITABLE BROILER RAISING

NICE WORK IMPORTANT

It is of great importance that the work be nicely (carefully) done, as a torn and marred chick is less attractive and fetches a lower price. The most successful broiler raiser quoted above pays five cents per chick for killing and picking, and when we commented upon the rather higher price than is generally paid he said: "I would rather pay that price and have the chicks carefully picked, the man picking fifty to sixty chickens a day, than to have a man earn the same amount of money by hurriedly picking one hundred a day. It is quite easy for a picker to 'skimp' his work, and the broilers would be a cheaper looking lot in consequence, shrinking the price perhaps four or five cents a pound." In other words, quality pays in broilers as well as in other things, and the fact that this man's broilers frequently bring him five cents a pound above the highest market quotations, approves the policy of paying the picker a good enough price to insure having the chicks carefully picked.

A good many farmers and small poultry growers ship their chickens alive to a commission dealer, who, in turn, sells them to a picker, who kills, dresses and markets them. Almost always these chicks shipped in alive, are not really good broilers; they are usually "lean" and thin, not plump and round, not well-fattened. A good business is done in buying up these "range" chickens, feeding them a fattening ration for two to three weeks, and then dressing them for market; which is some-

Mr. Pollard says: "In dressing chickens for market, they are killed by cutting the vein and penetrating the brain at a point well back in the roof of the mouth. A deep cut at just the right point will so paralyze the nerves of the bird that the feathers will pick very easily, and much of the trouble in tearing the skin will be avoided. The chickens are dry picked. All the feathers are taken from the carcass with the exception of the tips of the wings, and from these all the quill feathers are picked. If the birds have feathered legs these are also picked. The heads are left on, and the entrails are not drawn. After picking and carefully pin-feathering, they are dropped into huge tanks of water and left a suitable time to cool. In hot weather this water is iced in order to more quickly remove the animal



heat. They are then rinsed and the blood cleaned from their heads, and are laid on a bench for the water to drain off. After draining those that are nearest alike are paired together, the legs being tied with twine, and they are hung in a cool, dark room until the following morning, when they are packed and shipped to market."

THERE IS PROFIT IN BROILERS

61—BLOCKING CHICKENS INTO SHAPE

The upper view shows a row of chickens in a right-angle trough or "shaper", which rests on two barrels. The shapers are placed in convenient frames in the middle and lower views.

That there is good money made in raising broilers a careful study of the business reveals.

There is a great demand for this class of poultry meat, and of the best grade there is never a sufficient supply; furthermore, the demand is constantly increasing and will be still further increased by a better average quality of broilers marketed. Another point in favor of broiler raising is that the work-season of broiler raising for the highest prices comes at a time when other work is slack, hence the time utilized in the broiler raising is not wanted in other departments of the poultry work. Take advantage of the highest prices of March, April and May, and produce the very best quality of broiler chicks, and the resulting profits will be eminently satisfactory.

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In an article written and published some few years ago,

ARTIFICIAL INCUBATING AND BROODING

THE BEST VARIETIES FOR BROILERS

The best broiler chick is one that is grown quickly and fattens readily, is fine-boned and plump, full breasted, has a rich, yellow skin, and the strong constitution that will stand forced feeding. Undoubtedly the American breeds most nearly fill the bill. The white and buff varieties have the added advantage of freedom from dark pin feathers. A prominent broiler raiser lays strong emphasis upon the necessity of strength and vigor in the parent stock if we would have chicks that would live and grow.

"There is no question that many of the failures in broiler raising have come through improper tools with which to work, and a general misunderstanding of the best means to the end aimed at, which in this case is the plump, yellow and juicy little chick, which weighs from one and one-half to two pounds when dressed, or two to two and one-half pounds alive. Heavier birds may be used, but these are the weights which are best suited to the demand and sell most readily, which means, of course, at the best prices.

"How to get these plump, yellow chickens is the problem which we shall try to solve. Instead of beginning with the egg which is to produce the chick, we should go farther back, even back of the hen which lays the eggs, and find the health and strength of her ancestry. In other words, we examine her family tree. If, on due examination, we find the hen which is to lay our eggs is the offspring of some generations of strong, healthy birds, we may safely depend on her giving us the proper material on which to build our broiler structure. There never has been, and never will be, a successful broiler business built up on eggs from other than stock in perfect health and of strong vitality. The reasons are plain to see. In order to get your quick-grown, juicy broiler, there must be a forced growth from the very hatching, and the chicks must have the stamina and the vitality which alone come through inheritance, and which enable him to stand the hardest feeding and keep him busy and happy. The chickens from poorly fed, ill-developed parent stock, of hit-or-miss breeding, cannot, and will not, fill the bill.

"Next, after the strong, vigorous ancestry, we look for shape and color. Shape first, as on shape depends the ability to lay on flesh in the right place and in the proper proportions. Any of the American breeds will

answer this purpose. The oldest and best known is the Barred Plymouth Rocks, and they, when rightly bred for this use,

are splendid birds. Strong, hardy, and active, they grow quickly, and are good feeders. The Leghorns, while advocated by some, are too small boned and too sprightly to get up to weight quickly enough. The Asiatics are generally too large framed and too angular, when at the right weight, to satisfy a fastidious market. The Wyandotte family, as a whole, provides the best means to the broiler raiser. They are fine boned, yet with the plumpest breast development of any of the suitable breeds, and have stout, wide-apart legs and yellow skin.

"With these natural structural qualities, the Wyandottes unite the ability to fully assimilate the strong feeding which goes with all attempts to produce suitable chickens for this purpose. Of the varieties of Wyandottes either the Buff or White would certainly be preferable to the Laced, on account of the freedom from the dark pin feathers found in the others. This same reason, aside from the fact of their longer establishment as a pure breed, would give the Whites the preference."

Visits to the great market poultry raisers south of Boston reveal many varieties of stock used with the Light Brahma most in evidence; this is probably due to the fact that while raising broilers for market they are by no means exclusively broiler raisers, but grow large numbers of soft roasting chickens and capons. Next to the Light Brahmas a cross of B. P. Rock male on Light Brahma female is popular, and the well known market poultryman, Mr. J. H. Curtiss, places the White Plymouth Rocks at the very top of the list for all-round utility qualities. The same can be said of the "May R. Poultry Plant," while the Mr. Twining quoted above grew his broilers from Barred Plymouth Rock eggs bought of farmers living in his neighborhood. In all cases excepting possibly the "May R. Poultry Plant" the stock described is "farmers" stock of the varieties, and would no doubt be found lacking in some points essential in show birds.

DIFFERENT KINDS OF BROILERS

Frequent mention is made of "squab broilers," and yet we do not recall ever seeing them quoted in the market reports. Generally the squab broilers are little six or seven weeks old chicks that weigh, dressed, three quarters of a pound to one pound



BARRED
ROCKS

46 Lbs.
WINNING GESE-
(TOULOUSE)

SWEEPSTAKES
DUCKS
(CAYUGA)

BLUE RIBBON
TURKEYS
Hen

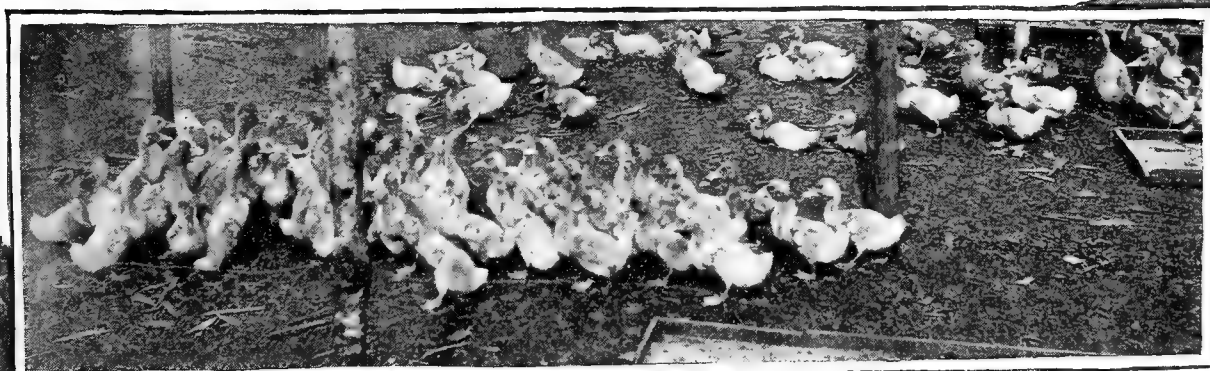
PROFITABLE BROILER RAISING

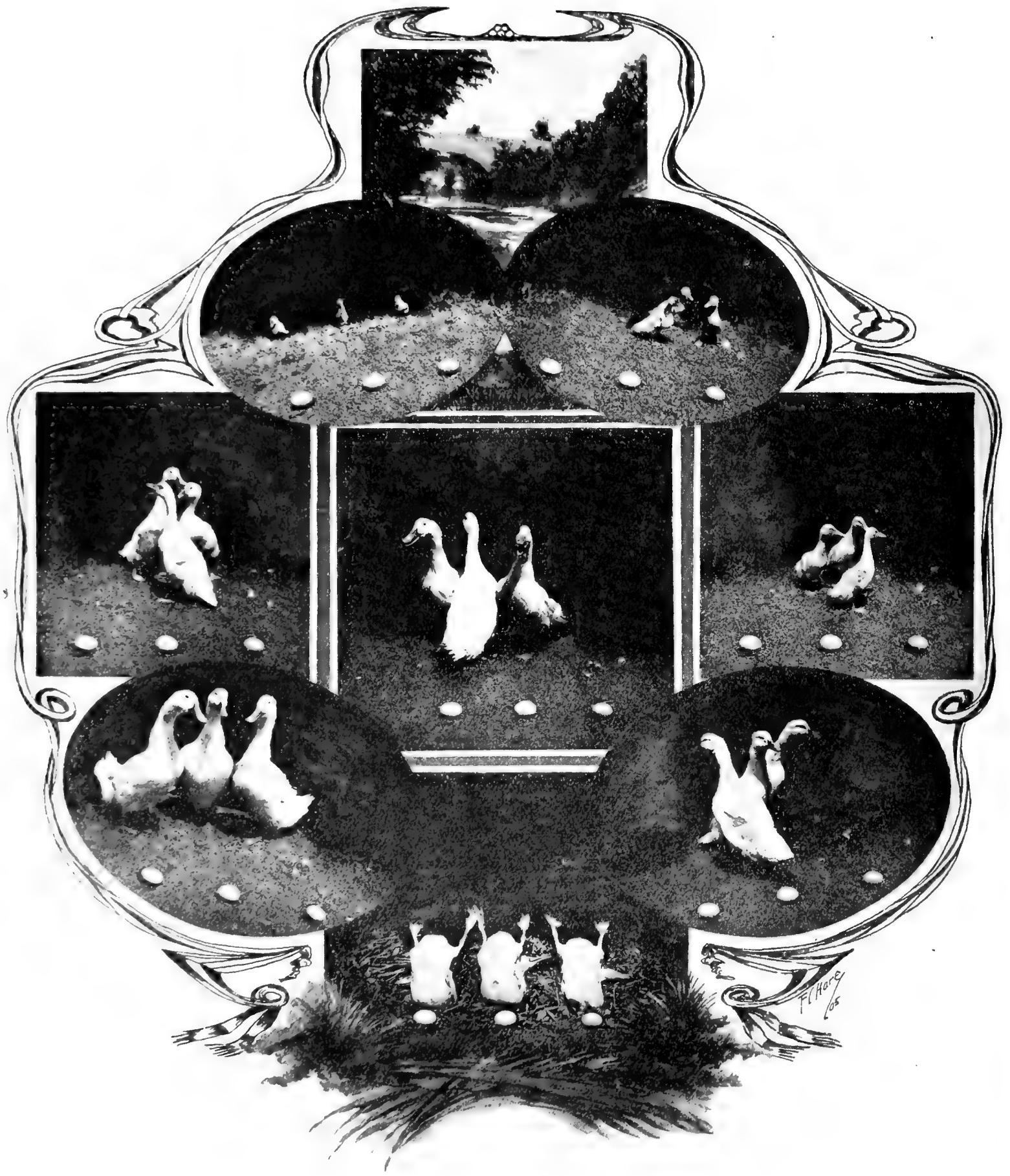
each; they are split down the middle and broiled for individual orders in high class hotels, restaurants and clubs. Mr. Duston tells us he "sold hundreds weighing eight ounces each," which is half a pound, and are the smallest broilers of which we have ever heard. There is a quite steady sale for squab broilers throughout the year, but, practically, all the trade is in the hands of dealers who have the finest private family trade and that of the swell hotels and clubs.

The broiler of commerce is a one and a half to two pound chicken, is split in half and served, broiled ("grilled") to two customers; a half to an individual customer. In a few instances we have known of these tender morsels of chicken flesh being stuffed and roasted, then split in halves and served to two individual customers.

A change has been gradually coming about, in the introduction of prepared (mixed) chick foods, and these special foods have given remarkable results in quick growth. Mr. Twining

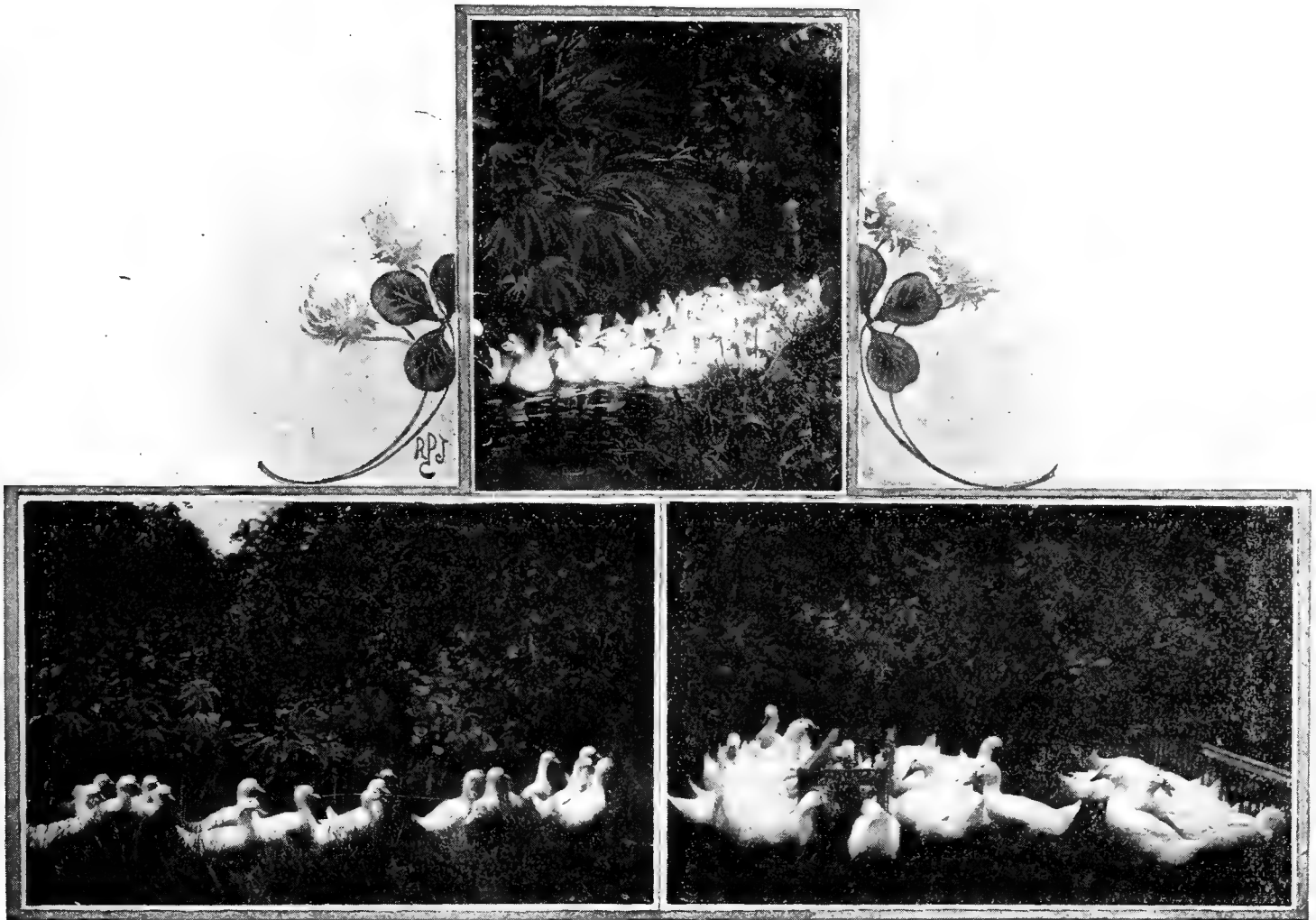
(quoted above) told us he couldn't grow a two pound broiler in eight weeks; that it took him nine weeks (on an average) to grow a one and a half pound broiler and about eleven weeks to bring them to two pounds weight. We have known of White Wyandotte chicks that grew to two pounds apiece at eight weeks old, and those chicks were not "forced" at all; they were fed one of the special chick foods advertised in our columns and made the splendid growth there chronicled in the natural manner. Obviously there is a decidedly greater profit in two pound chicks at eight weeks old than in two pound chicks at eleven weeks old; we cut off a fourth of the labor and food-charge, and coal for heat, at a stroke. We have seen that there was a goodly profit in the plump and juicy broiler that grew to two pounds weight in eleven to twelve weeks; it is easy to see a still greater profit in the same product grown in eight weeks.





63—SEVEN AGES OF THE PEKIN DUCK

HATCHING AND BROODING OF DUCKS



ARTIFICIAL HATCHING OF DUCKS

A PROFITABLE INDUSTRY IN WHICH THE FARMER HAS MANY ADVANTAGES—HOUSES AND FIXTURES REQUIRED—BROODING AND RAISING THE DUCKLINGS—SELECTING AND FEEDING THE BREEDERS—FATTENING—PREPARING FOR MARKET

H. A. NOURSE

Within recent years the raising of ducks has grown from conditions under which a few ducks raised themselves, so to speak, without particular care from the owner, to an industry, of immense magnitude managed with the strictest care as to details and representing an annual investment of many thousands of dollars. Under other than artificial means of incubating and brooding such a wonderful development would have been absolutely impossible.

It then seems fitting that in a work of this character the incubating and brooding of ducks by artificial means should receive the attention which its importance as an industry merits.—Editor.



YOUNG duck carrying five pounds or more of salable weight that will command an average price of twenty cents per pound can be placed on the market eight weeks from the date of hatching. This is quick work—turning a profit in twelve weeks from the time the egg is laid—and no proof is needed that a substantial profit can be realized on ducks so marketed. Therefore, since the loss of ducklings need not be over five per cent (frequently it is not

over two per cent), and the equipment required is neither extensive nor expensive, there is money in raising ducks for anyone who will make an honest, intelligent effort to get it.

Growers of ducks frequently have everything to buy at market prices and some even have to go off their farms to secure sufficient green food for their flocks. The farmer with his wide acres is prepared to feed ducks at the minimum cost. He has at hand much of the grain produced on the farm at less than its market value and this the exclusive duck raiser has to pay good money for. The vegetables, which are often difficult for the duckman to obtain, the farmer sorts out from his potatoes, turnips, beets, cabbages, etc., and places but little value upon them. Fed to ducks this inferior quality will produce meat salable at fifteen to thirty cents per pound. If the farmer is a dairyman the skim milk fed to stock ducks furnishes the best of nourishment at little cost and if fed to growing ducklings will produce twice or three times the value it would if fed to swine.

Nearly one-third the bulk of food for breeding ducks may consist of vegetables and clover. The latter can be grown on

ARTIFICIAL INCUBATING AND BROODING

the farm and cured in the shade of the orchard or on the barn floor out of the sun, but open to the fresh air where it will cure perfectly and if stored away in a clean, dry place it will make the best of green food when treated with boiling water and added to the mash.

There is always a demand for well fattened ducks, and a simple announcement that they can be secured is all the requirement necessary in localities where the flavor is known.

Thus it is seen that the farmer is able to secure the last cent that the profitable business will yield and that for little cost,

As before stated, expensive buildings are unnecessary and since additional capital expended means less profit on the investment they are not desirable. A house built with a shed roof, high enough to give head room to the attendant and twelve feet wide exclusive of alley, or fifteen feet if a walk or alley is desired, will accommodate two ducks to each foot of length. It may be framed of two by four inch pieces, these to be covered with barn boards and roofing material. Such a building should be located on a well drained spot, facing south or southeast when convenient, with liberal yard room enclosed by a wire netting fence two feet high. One window in each twelve feet of house length will admit sufficient light to the pens.

Opinions differ somewhat as to the utility of a walk, some claiming that it is nearly as easy and far better for the caretaker to go from pen to pen over the division boards two feet high because he exercises more care in distributing the food; but in a house fifty feet long or more the argument is in favor of a walk at least three feet wide along which the feeder can pass, feeding the occupants of each pen over the low partition or carrying fresh bedding or removing the old when cleaning the house, without frightening the inmates.

A floor of earth made by filling in to the top of the foundation is better than boards or cement, which hold the water spilled by the ducks about the water fountains, making the pen damp and uncomfortable, requiring far more bedding to make it habitable.

The pens may be twelve feet square, with the yards of corresponding width. If the partition separating the pens from the walk is made with laths set two and a half inches apart the drinking water may conveniently be given in V-shaped troughs at least half as long as each pen, placed in the walk where the ducks can reach them through the slats. If water is piped to the house, a trough extending the length of the house and connected with the piping makes it possible to water the houseful of ducks by simply turning on the water. In a long house this is a great time saver.

A hopper or box with compartments for shell, charcoal and grit and a trough for food completes the equipment of the stock duck house.

BROODERS AND BROOD HOUSES

The cost and construction of the brooding equipment naturally depends upon the extent of the operations contemplated. Frequently there are buildings about the farm in which could be placed brooders enough to raise several hundred ducklings, but we will consider that the importance of this branch of farm industry warrants building those required.

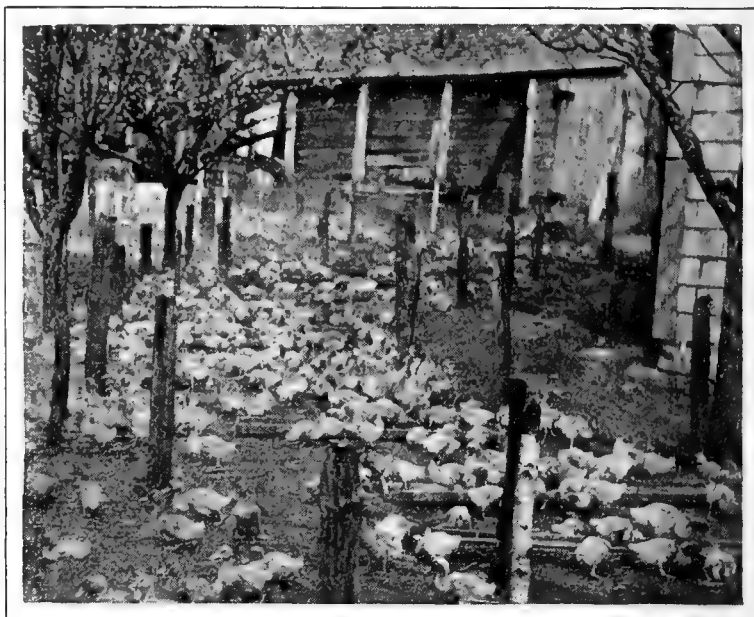
A brooder house sixty feet long, fifteen wide, arranged with an alley or walk three feet wide next the north wall, having pens twelve by five feet, will enable the builder to properly brood one thousand or more young ducks to sell during the season of good prices. The early ducks are the money makers, and to secure the warmth necessary for the best growth of the little ones, besides economizing fuel, it is advisable to build this house snug and warm, but with windows and doors sufficient to thoroughly ventilate and cool the house in spring.

If a good house of this kind is built the least expensive and probably most satisfactory method of brooding is with hovers heated by hot water pipes. These hovers should be two feet

six inches wide and extend through eight of the pens, leaving four pens without hovers in which to temper the ducklings before removing them to other houses or to yards outside. To heat these hovers four one and one-half inch pipes, two flow and two return, are needed, attached to a water jacket stove or small boiler.

Eight lamp brooders can take the place of these hovers, if it seems desirable, and a hot water pipe system may be installed to warm the house in cold weather or omitted entirely at the builder's option. The combination of lamp brooders and pipe system is a good one especially useful in the early season, while the lamp brooders alone will suffice in warmer weather.

If operations are fairly extensive and work is begun early in the season it is convenient to have one or two other wind and water tight buildings to which the young ones can be taken when forced out of the brooder house by the new arrivals from



64—HEALTHY DUCKLINGS TWO WEEKS OLD

the incubators; but if the weather is warm before the brooder house becomes congested and the occupants are nearly feathered no more house room will be needed and yards of good size enclosed by fencing two feet high, with a provision for shade from the sun, will accommodate the ducks in flocks of fifty to two hundred.

I have not made special provision for an incubator room because a dry, well ventilated basement or an unoccupied room in a house will answer for the work better than many houses that have been built for the purpose.

This is practically all of the equipment needed and it will last for years, making each year's share of the cost but little.

What branch of animal industry on the farm will so quickly turn so large a profit for the expense incurred?

SELECTING AND FEEDING THE BREEDERS

Quality is the point of importance when buying breeding stock, for the influence of the original purchase lasts for years and determines to some extent the value of each season's product. Vigor is the primary consideration. The degree of profit depends upon the ability of the individual specimen to digest rapidly and well every ounce of food, turning it into flesh with the least waste, which is the work of a healthy, vigorous system. Large birds are desirable, but not monstrosities, and a well-shaped, deep-keeled bird of a little more than medium size is more satisfactory than a larger one with a coarse, angular frame and consequent slower flesh development.

Early hatched, fully developed young birds make the best breeders, with well conditioned yearlings a close second.

HATCHING AND BROODING OF DUCKS

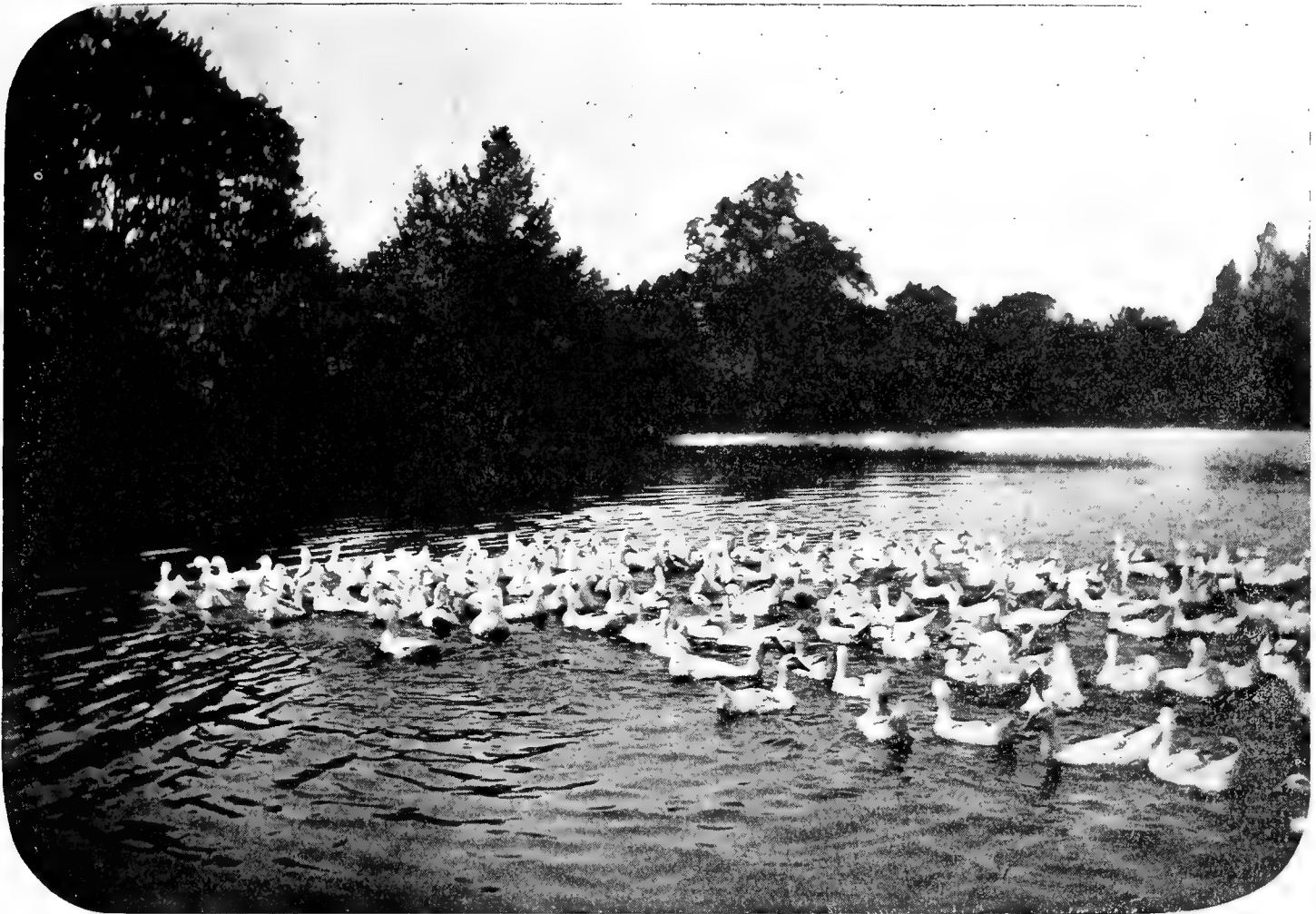
A group of young ducks bought in the fall and well cared for through the winter will begin to lay in January and continue through the spring. They should not be fed for laying in the fall or many of them will lay a litter in the early winter and not lay again until spring. A mash of vegetables and bran chiefly, with a ration of corn or wheat occasionally and very little meat, will prove a good bill of fare until Christmas, when it may be gradually strengthened until it contains something like one part of corn meal, one and a half of bran and the same of cooked vegetables or steamed clover plus ten per cent of beef scrap. This fed every morning and alternated with corn, wheat and oats at night, supplemented by plenty of fresh water and a supply of shells, grit and charcoal, will produce eggs that will hatch if the ducks are fed just as much as they will eat, and any remaining is removed after each meal from the trough

nourishment and send them to the next season's breeding pens with lusty good health.

RAISING AND FATTENING THE YOUNG DUCKS

Incubating is in no way difficult and the method is identical with that recommended for hens' eggs except that one week longer time is necessary. The little ducks are placed in hovers having a temperature of ninety-five degrees, which after a couple of days is reduced to ninety and further reduced to eighty in two weeks' time.

The first feeds are best composed of stale bread moistened with milk and a little fine sand or grit sprinkled in. This is gradually replaced by a simple combination of ground grains mixed with milk or water, to which is added five per cent of fine grit and a little meat scrap. One of the simplest rations



65—FLOCK OF BREEDERS ENJOYING A LARGE INLAND POND

in which both mash and whole grain are fed.

When producing eggs steadily it is frequently necessary to increase the proportion of corn in the mash, the thin flesh of the ducks indicating the necessity. A specimen very thin in flesh will not produce strong, fertile eggs.

When the young ones are developing, previous to the fattening period, those that make especially rapid and vigorous growth and show a symmetrical development should be selected for next season's breeders and when six weeks old should be separated from those intended for market. Place them in a well-grassed and shaded yard of considerable area to develop naturally until the cold weather of the fall drives them to winter quarters. The old ducks, breeders of the previous season, should be likewise turned out to pasture and may be allowed to forage for most of their food on free range if it is convenient for the owner. A swampy meadow, generally unused after the grass is cut, will supply a flock of ducks with over half of their

consists of one part corn meal and two of bran mixed with milk and having five per cent each of beef scrap and grit added.

These simple foods, with a liberal allowance of grass or garden truck and a supply of coarse grit and good water, will grow big ducks if other conditions are right

Fattening is easy if the subjects are in good health, and three parts of corn meal, one part bran and one of scraps, mixed with milk when obtainable, will fatten the healthy duck in one week fit for the most exacting market. Some growers substitute an equal bulk of ground oats for half of the corn meal and claim better results.

Killing and picking is simple and no loss need be sustained if reasonable care is taken when dry picking or scalding. The proper time to kill and best time to pick is when the first full coat of feathers has fully matured, which usually is about the end of the eighth week, when a well grown duck will be fat and heavy.

HATCHING, FEEDING AND MARKETING DUCKS

THE GREAT GAIN IN USING INCUBATORS—FEEDING FOR QUICK GROWTH—PICKING, PACKING AND SHIPPING TO MARKET—SOME ITEMS FROM EXPERIENCE OF SUCCESSFUL BREEDERS—THE EARLY DUCKLINGS SHOULD HAVE BROODER HEAT

A. F. HUNTER

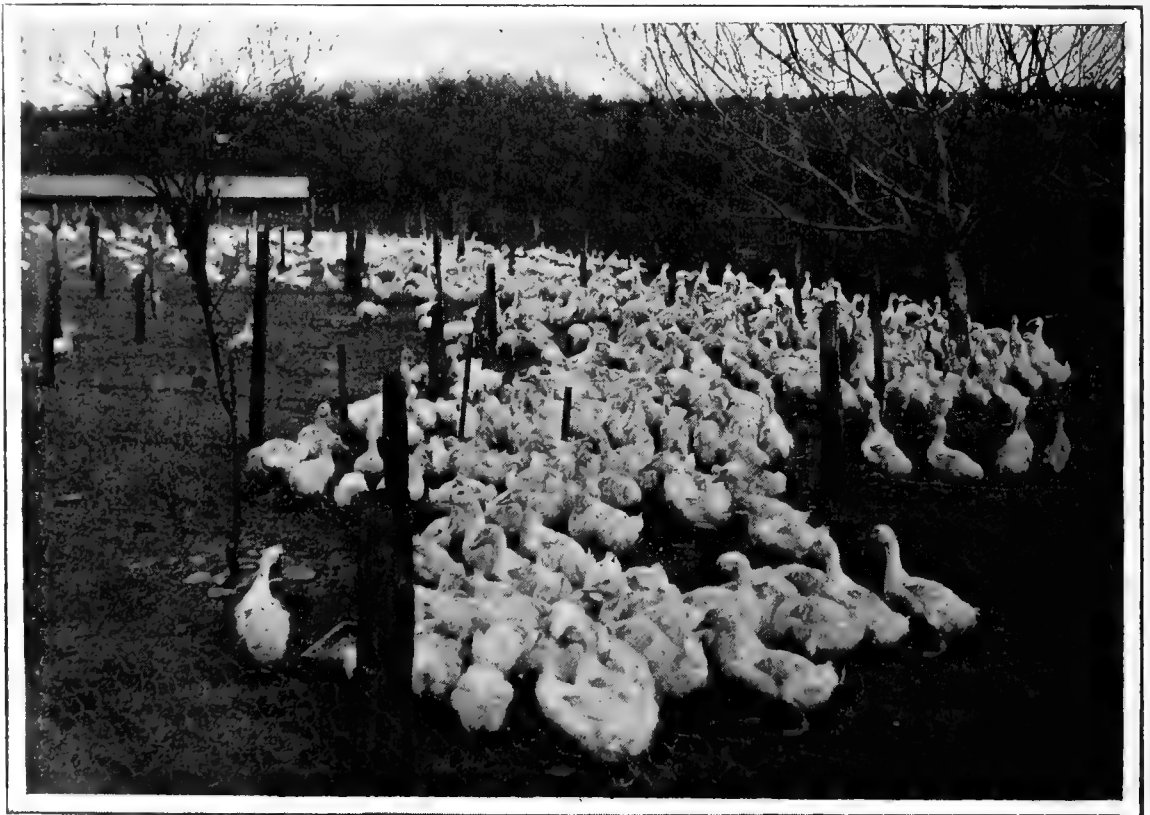
THE development of the modern incubator has made possible the enormous growth of the market duck business. It is but a comparatively short time since very few ducks were sold in the city markets, and these ducks were hatched under hens and reared on free range, usually with a brook or small pond as a feeding ground. Fancy hatching twenty, thirty, or forty thousand duckling under hens! It is easily seen that the great duck ranches would be impossible without the aid of the modern incubators.

No inconsiderable part of the great gain made by duckmeat in popular favor is due to the fact that the ducklings are hatched in incubators and raised in brooders, and because they never go out of the comparatively small pens of the brooder houses and fattening sheds until they are killed for market. We had a talk with three or four different marketmen recently upon this point, and asked them if they received any free range ducks now. Only one said that he had a few sent in from a farm up the state recently, and that he had quite a time selling them. They were small, lean and tough; would be mighty poor eating unless parboiled for two or three hours before roasting, and he had to sell them to a cheap boarding house keeper for a little more than half what first-class ducks were worth. Probably the shipper of those "puddle ducks" cannot understand that his product is very inferior to the quickly grown, tender and toothsome duck raised in confinement.

On the large duck ranches one man usually has charge of the incubators. Mr. Rankin takes care of the incubators on his farm, and has a general oversight of all the work. On the Messrs. Weber's duck farm one of the brothers runs the incubators and feeds the ducklings in one of the brooder houses. On the McCormick-McFetridge farm Mr. McFetridge handles the incubators, and finds time to oversee the work of all departments, but he has the incubator work so planned that he never wastes a minute in thinking what he must do next. He has forty-eight 360-egg incubators, which gives him twelve to set each week—when they are running full blast. As the eggs come in from the laying houses they are washed and placed in empty trays on the floor under the machines next to be "set." These machines are filled on Tuesdays and Fridays,—six at a time. The eggs set on Tuesday are tested on the following Monday, and those set on Friday are tested on the following Thursday, and the ma-

chines are emptied on Wednesdays and Saturdays. The machines should be left to dry out for a few days, those that are emptied on Saturday dry out till the following Tuesday and those that are emptied on Wednesday are empty till the following Friday. By having things thus systematized the work goes on with clock-like regularity, a most important aid to "getting things done."

Duck eggs can be tested in four or five days, the dark spot which is the embryo being clearly seen as the egg is held up to the tester. On breaking the egg, this dark germ spot can be determined after one day's incubating, and is then about as large as a large pin-head. It practically doubles in size with



66—FIVE-WEEKS-OLD DUCKLINGS THAT SHOW RESULTS OF SCIENTIFIC FEEDING

each day of incubation, and on the sixth day is spread over a space as large as a quarter. The infertile eggs remain perfectly clear and should be taken out and boiled for the newly hatched ducklings, or may be used for human food; the dead germs should be removed from the incubator as soon as they are detected, as they will soon vitiate the air in the machine, which the living embryos have to breathe. When a duck egg inside the incubator shows a discoloration of the shell remove it at once, as that is a dead germ.

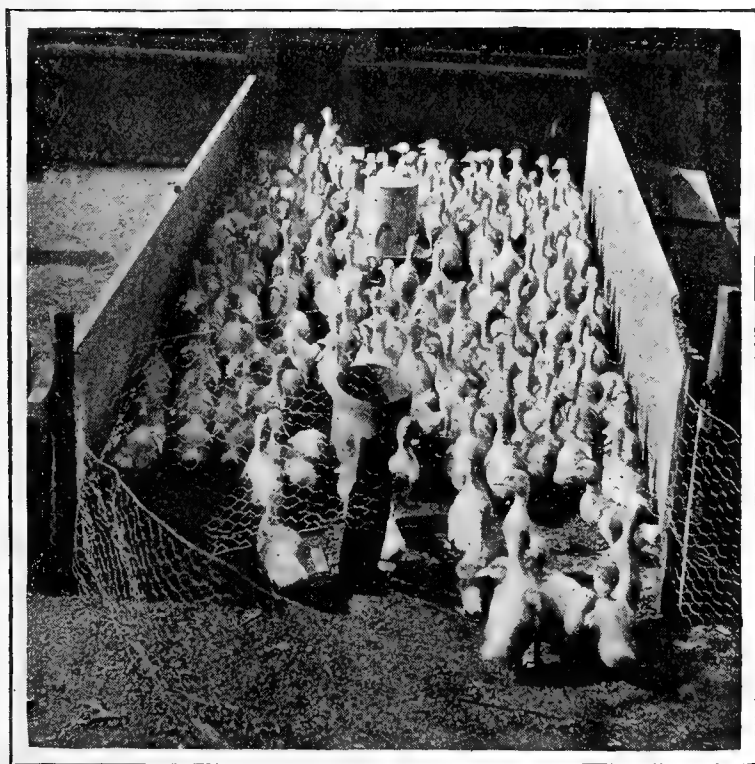
A duckling does not break the shell directly after it is pipped, but will lie quiet for twenty-four to forty-eight hours. At this time there should be plenty of moisture in the egg chamber, so much that it will condense and run down the glass of the door; if the membrane around the orifice of the shell dries the duckling may become attached to it and be unable to work his way out. When the hatch is well over the operator can take

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out the egg quickly, break the shell and release the duckling, putting him back at once into the warm machine. When nearly dried off the ducklings should be dropped down into the "nursery" space below the egg trays (if there is no opening through which they fall down), where the temperature is a few degrees cooler than in the trays; this also prevents their turning over and disturbing the unhatched eggs. About once in four or five hours the dry ducklings should be dropped down, but the work should be done quickly, so as to derange the temperature of the egg chamber as little as possible. After the hatch is well over let the ducklings remain in the nursery chamber for about twenty-four hours, then they are removed to the brooder house and put in the warmest pens, next to the heater.

BROODING AND FEEDING THE DUCKLINGS

To carry the ducklings from the incubator to the brooder house a square basket, about 2 feet 6 inches long by 15 to 18 inches wide and a foot high, is the lightest and best thing. Some duck farms use handled boxes, similar in shape, but the added weight is a drawback. On the basket are close covers, hinged at the center, to keep the little fellows secure and protected from the wind. Such a basket as here described will hold about a hundred ducklings. When it is filled it is carried to the pen



67—DUCKLINGS ONE WEEK OLD

in the brooder house and the birds carefully tipped out onto the feed board, where a small supply of food has been placed. The food at first is the infertile egg boiled hard and chopped fine, mixed with about four times its bulk of stale bread crumbs, or cracker crumbs, and having about five per cent of its bulk coarse, sharp sand or fine (chick-size) gravel. They should be fed every two hours for the first few days, feeding only a little at a time, and see that the food is all eaten up before feeding again. If any food is left uneaten it should be cleaned off the boards and thrown on the fertilizer heap; it will be so soiled as to be unfit for feeding again.

The temperature of the brooders should be about 90 degrees at first, and the animal heat of the little ducklings will bring the heat up to about 95. After carrying them through a couple of nights at his temperature 90 degrees will be warm enough, and after a week 80 to 85 degrees. After the first few days the

attendant can regulate the heat by the appearance of the ducklings. If they seem happy and contented, and cuddle down comfortably under the hovers, they are warm enough. If, however, they bunch together and cry discontentedly, they need a little more heat. If they are disposed to push out from under the hover there is a little too much heat, and the temperature should be lowered to a point which will draw them in under the hover.

At one plant the baby ducklings are confined close to the hovers by a board about a foot high, having two end-pieces 18 inches long nailed across so that one end makes a pen 6 inches wide across the breadth of the pen, or, reversed, it makes a pen a foot wide across the pen. In very cold weather these partitions are put up at night to confine the ducklings close up to the warm hover space. On another large duck plant these partitions boards are fitted to slots fixed to the sides of the pens, and when taken up are slid up onto the top of the collar-beams (boards) overhead, and are always within reach when wanted.

In an excellent article in the report of the R. I. State Board of Agriculture, the following feeding directions are given: "In times past all sorts of mixtures and all kinds of fussing have been recommended in feeding young ducks. The biggest and best breeders of the present day, however, do very little fussing, and the food mixtures are of the plainest kind. I have found a mixture of two-thirds wheat bran and one-third corn meal, with a handful of fine gravel or coarse sand mixed in, for the first two or three days, sufficient for all their needs. If skim or whole milk is easy to get, it may be used to moisten this mixture to a crumbly consistency; otherwise either hot or cold water will answer. I frequently break raw eggs into the meals, in the proportion of two eggs to one quart of the dry grain. This must be thoroughly mixed in order that it may not be too pasty or sticky. After the first three days I omit the sand or fine gravel, and by the fifth day begin to feed a slight proportion of beef scrap. This proportion may be gradually increased until, at two weeks old, they are getting five per cent of beef scrap; at three weeks old their food should be one-half bran, one-half corn meal, and about seven per cent of the whole mixture beef scraps. Gradually increase the animal matter until at five weeks they are having 15 per cent. This proportion may be carried until killing time, which, under ordinary conditions, should be at ten weeks, when they should weigh from ten to twelve pounds per pair.

"Early hatched ducklings should have brooder heat for practically the whole ten weeks. At least, they will require houses that are slightly warmed even after feathering, or too much of the food consumed will have to go toward making heat instead of flesh. After the warm spring months come the birds will require less heat, and after the first of May probably fourteen to twenty days will be all the hover heat they will need. After that time a house dry and free from draughts will meet every requirement. It must be kept sweet and clean, however, and it becomes necessary to keep continually at the cleaning.

"Dry planer shavings make the best litter for the floor for both old and young stock. Sawdust is fairly good, but mixes too readily with the food of the young birds. Straw and gravel are both bad, as they become wet quickly and are slow to dry. Whatever material is used, it must be kept dry or disaster will follow. Keep drinking water, grit and shell by the young birds at all hours. Have the water supply so that they can get at it night and day. This will save undue thirst and the loss of many of the birds by the tramping and wetting which comes after being shut away from the water for any length of time. Standing in a brooder building any moonlight night one can see a constant procession of little birds going to and from the water fountain, and this in itself is proof of the need of its being there."

ARTIFICIAL INCUBATING AND BROODING

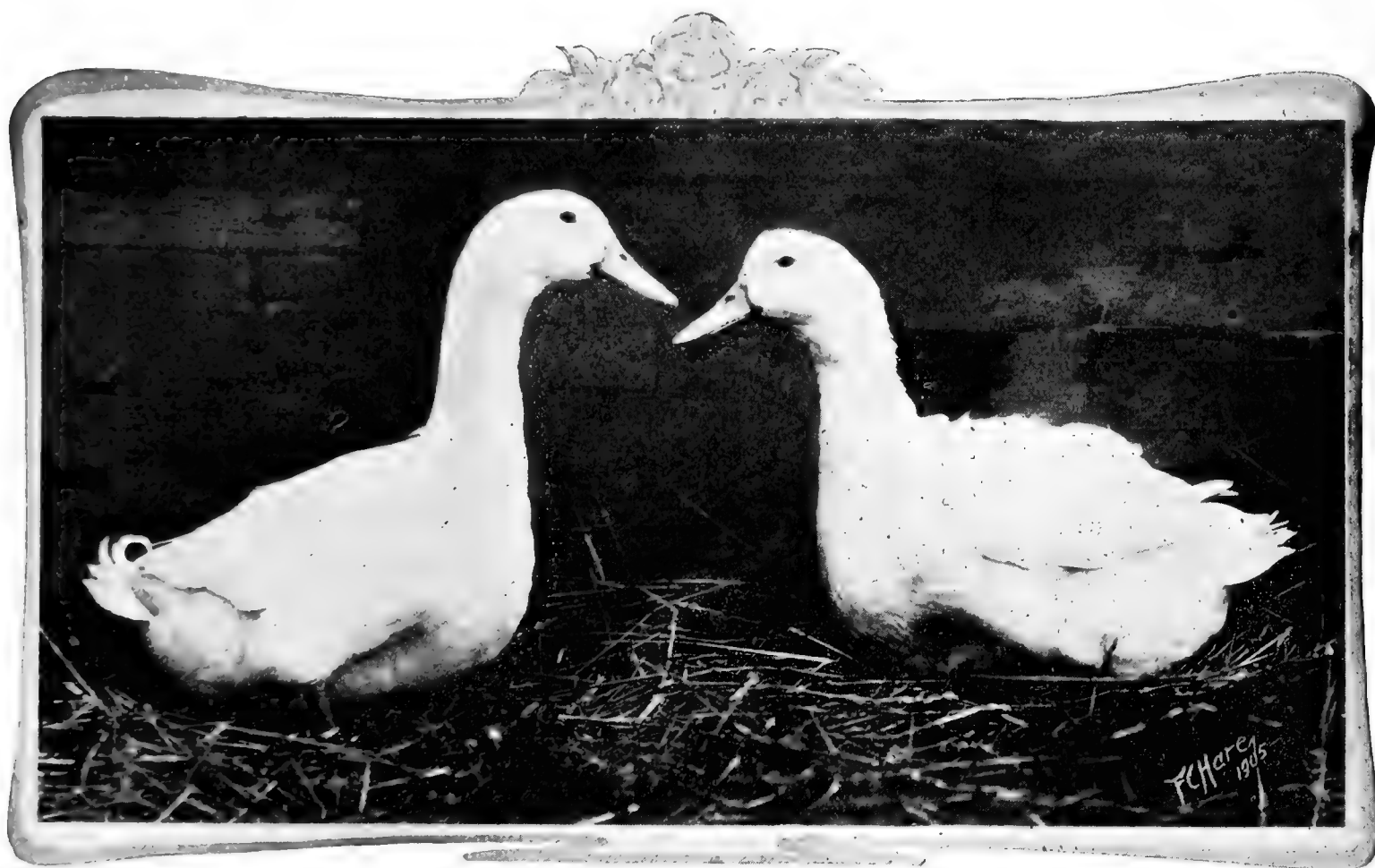
DRESSING AND MARKETING DUCKS

Ducks should be dry picked for the eastern markets. In handling (as catching them for the pickers), they should be caught and lifted by the neck; there is great danger of breaking a leg when they are caught by the legs. On large duck ranches the picking is done by professional pickers, who are paid so much per head for killing and dressing. The ducks are selected by the owner (or foreman) and cooped ready to hand in large boxes in the picking room. The picker grasps one by the neck, inserts the killing knife in its mouth and sticks up through the roof of the mouth, into the brain. The picking begins immediately, while the muscles are relaxed, and before the death struggle is over the picking is done. The "down" is then rubbed off with the fingers and ball of the thumb, which are kept damp by dipping now and then into a pan of water. Such pin-feathers as are started are then shaved off with a keen-edged knife, usually a broad-bladed shoe knife. The tip joint of the wings is not picked, and a ring of feathers is left upon the upper part of the neck, next to the head.

chunk of ice of twenty-five or thirty pounds weight is placed on top, a thickness of burlap spread over all and secured by driving the top hoop down over and nailing on, the address tag tied to the burlap, the weight of the package marked on the side and it is ready for the expressman.

There is good money in raising ducks for market. The ranks of the duck growers are continually extending, but the consumptive demand is also constantly extending, and the demand keeps ahead of the supply. The consuming public recognizes the high quality of the improved duck, and it is only necessary to keep up the quality to have the demand steadily increase.

In the height of the season, which is June, there are about twenty men employed, eight or ten being pickers, eight others on the general work of feeding, watering, etc., and two on general farm work, teaming grain and supplies from the railway three miles distant, etc. After the five or six months of strenuous life is past there comes a time of comparative leisure when a well earned vacation can be taken. In the fall months buildings are built or repaired, the yard ground ploughed up



68—TYPICAL ENGLISH AYLESBURY DUCKS

After being picked and pinned the birds are tossed into a tank or barrel of cold water and left to cool for a couple of hours. The packer takes the cooled ducks from the tank, washes the blood from the mouth and head, ties the wings close to the body and packs them in cases or barrels for shipment. They should not be packed till thoroughly cold or until all animal heat is out, and if the birds are to go a journey of several hours they should be packed in cracked ice to keep them in good condition. Mr. Rankin, at the time of my visit, was shipping his ducks to Boston dealers, and as it is only an hour's ride there was no need to ice them; most shippers, however, have to ship the night before in order to have the birds at the dealers' stands in the morning, and the birds are always iced. The Messrs. Weber put a layer of ducks in the bottom of a clean barrel, then a thin layer of cracked ice, then more ducks, firmly packed in, and more ice, and so on. When the barrel is even full a

and sown to rye, both to sweeten it and furnish fodder for the cows and green food for next spring's ducks, and in the winter the duck-raiser can "live on easy street."

Messrs. Weber Bros. breed from two-year-old ducks only, all the eggs from ducks in their pullet-year being used for hatching market ducks. An item of increased cost which must be considered is the over-crowding of the birds. They now put 150 to 175 youngsters into the pens in the cold houses and as many as 200 birds in each flock in the pens in the fattening sheds, and one of the brothers told us that in small flocks the ducklings would grow to marketable size and condition a full week sooner than where they were so crowded. House room and yard room are items in the expense account, but there is a week's additional food and labor cost to counterbalance it. Is it economy to crowd the birds?

An item of considerable income is the feathers, of which

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the Messrs. Weber sold about 4,000 pounds (two tons!) last year. As the feathers fetched thirty-eight to forty cents a pound, here was an income of from \$1,500 to \$1,600 from feathers alone.

The steady increase in duck production has been made possible by the improvement in methods of hatching and brooding; in no other branch of the poultry business are incubators and brooders used with so generally good results, and the compar-

ative perfection of the up-to-date incubators and brooders of to-day makes possible the hatching and rearing of a very large per cent. As the infant mortality is slight and ducks grow to marketable size in ten or eleven weeks' time, the grower soon begins to realize a profit upon his investment, and the steady increase in public appreciation and consumption of so desirable a table delicacy insures a sound, healthy development of the business.

"IF I WERE TO START AGAIN"

THE MAN WHO IS OFTEN REFERRED TO AS "THE FATHER OF THE PEKIN DUCK INDUSTRY IN AMERICA" TELLS WHAT HE WOULD DO IF HE WERE TO START ANEW AND GIVES VALUABLE ADVICE IN REGARD TO CARE AND ATTENTION

JAMES RANKIN



IF I WERE to start over again in the duck business, I should not begin as I did. I have learned many things, during the past thirty years of experience in duck growing which I did not know when I first began. One is, that labor is the most expensive item in the whole business, and a plant should be systematically laid out so as to minimize that. It is a poor policy to erect a small group of buildings, making them a nucleus to build around as you increase your plant from time to time, as so many are doing, and making the whole thing about as inconvenient as can be. Select a piece of ground with considerable slope to the south. Sandy land, if level, will not answer the purpose, as the birds will soon puddle it and make it water tight, and then trouble begins. We make our breeding and broodings houses fifteen feet wide with a walk in the rear, and four feet in front. This necessitates an uneven double pitch roof. It makes a stiffer, warmer building than a shed roof and requires less lumber. For breeding birds, these buildings are divided off into pens 12 by 18 feet for thirty birds, each, the yards outside being of the same width and about 100 feet long.

Located in warm buildings of this kind, judicious feed and care will soon compel the birds to lay. But it is one thing to induce egg production during the winter season, and quite another to secure highly fertilized eggs, which can only be done by a careful feeding and a well balanced ration. See following formula for feeding laying ducks:

Equal parts wheat bran and corn meal; twenty per cent of Quaker oat feed; ten per cent of boiled turnips or potatoes; ten per cent of clover-rowen, green rye or refuse cabbage chopped fine; five per cent of grit. Feed twice a day all they will eat, with a lunch of corn and oats at noon.

We never cook the food for our ducks after they are a week old, but mix with cold water. The birds should be fed all they will eat up clean of this ration twice a day. Never keep food by them or allow it to sour. They should not be let out till they are through laying in the morning.

They should be watered at least four times each day. It would be a great saving of labor if a small stream or brook should run through the lower part of the yards so that the birds could obtain water at will. We usually mate about one drake to five ducks.

As a rule, the first eggs laid by young birds are apt to be infertile, though if the birds are well cared for and fed, the fertility rapidly increases and will often reach from ninety to ninety-eight per cent. Of course the hatching should be done artificially. The incubators should be located where the temperature is as nearly uniform as possible. The eggs should be turned carefully twice a day, moving them from the ends to

center of trays and vice versa. The machines should be run at 102 degrees the first fifteen days and at 103 degrees the remainder of the hatch. The eggs may be tested the third day of incubation. They should be cooled a little once each day, especially the latter part of the hatch, though usually they are cooled sufficiently while turning. No specified time can be given, as that depends upon the temperature in which the machines are located.

WHAT TO FEED

The little birds should be left in the machine for about thirty-six hours after hatching. The heat in the brooders should be about ninety degrees the first day or two and be gradually reduced as the birds become stronger. Feed them according to formula, as follows:

The first four days, feed equal parts of rolled oats and cracker crumbs; ten per cent hard boiled egg, chopped fine; five per cent coarse sand. Feed four times a day what they will eat clean.

From four days to three weeks old, feed equal parts of rolled oats and wheat bran; ten per cent corn meal; five per cent coarse sand; five per cent fine ground beef scrap, soaked. Give finely cut green clover, rye or cabbage. Feed four times a day.

From three to six weeks old, feed equal parts corn meal, wheat bran and Quaker oat feed; three per cent fine grit; five per cent beef scraps. Mix in green food. Feed four times a day.

From six to eight weeks old, feed three parts corn meal; two parts wheat bran; one part Quaker oat-feed; three per cent grit. Feed three times a day.

From eight to ten weeks old, feed two-thirds corn meal; one third equal parts of wheat bran and oat feed; ten per cent beef scrap; three per cent grit. Give oyster shells and less green food. Feed three times a day. They should now be ready for market.

Our brooding arrangement consists simply of a two inch flow and return pipe running horizontally, ten inches apart the whole length of the building and boxed in about two feet wide, the upper boards resting upon the pipes. This brooding box should be partitioned every four feet with pens of corresponding width. The distance between the pipes and floor should be at first about three inches, gradually increasing it as the birds grow larger. The top half of these brooding boxes is hinged in the center next to the walk, so they can be lifted up to facilitate cleaning.

Water pans should be arranged so that the little birds can get their bills in to drink and not their bodies. From sixty to seventy-five ducklings are a full complement for each of these pens and when four weeks old they should be removed to larger quarters.

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Great care should be taken to disinfect the pens and keep them dry and clean, as neglect in this particular will soon manifest itself in the sore eyes and emaciated bodies of the young birds and a great mortality will surely follow.

One thing I neglected to mention is, that uniform heat should be kept in the brooding boxes. The pipes are supposed to radiate the same amount of heat the entire length of the building. The ducklings, as they grow older require less and less. We obviate this difficulty by increasing the distance between the pipes and the floor, always putting the newly hatched birds next the heater and moving the older ones towards the other end of the building to make room.

For one embarking in the duck business, I should advise purchasing eggs from a reliable grower of first class stock (one who will guarantee fresh, fertile eggs) and secure enough of them to produce all the breeding stock for the coming year. The advantage of this course over purchasing a few breeding birds to get stock is obvious; it will give early birds of one age that will be ready for business and reproduce early in the season, and the care is soon over. A few old birds would give but a few eggs each day, which would either necessitate hatching them under hens or keeping the eggs till they were old in order to fill a machine, and it would be necessary to be hatching the entire season; the young birds would be of all ages and would not be uniform in size and value.

In regard to the relative profit derived from growing ducks or chickens, would say that there is very little difference. Ducklings during March and April usually command from thirty to thirty-five cents per pound in Boston and New York markets, while roasting chickens are then worth twenty to twenty-five cents per pound. During June and July, chickens readily command from thirty to thirty-five cents, while ducklings are worth but fourteen or eighteen cents in the same market.

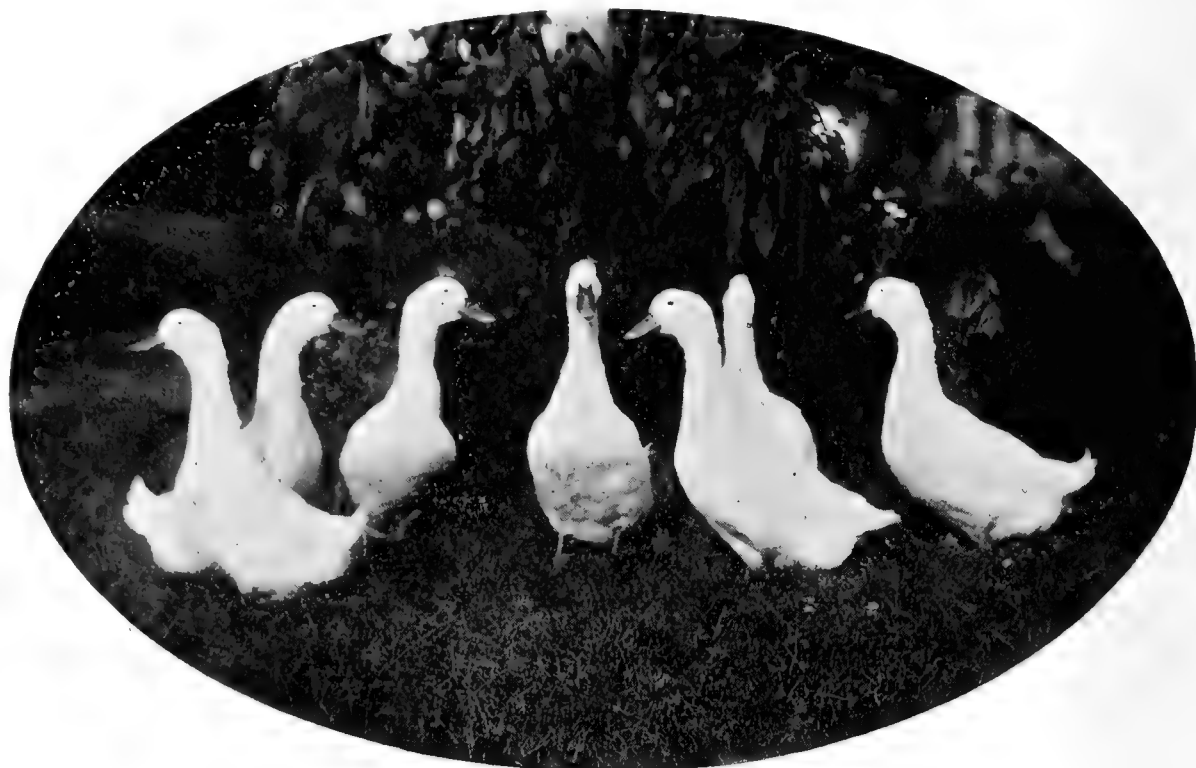
PEKIN DUCKS

MATING, HATCHING AND FEEDING—FEATHERS A SOURCE OF CONSIDERABLE PROFIT

FRANCES E. WHEELER

IT DOES seem rather hard on us sometimes that we are able to profit so feebly by the experience of others and with all the wish in the world and the willingness can "pass on" so little of our knowledge to those we would fain help if we could. "Work out your own salvation" is an iron bound law and applies quite as truly to man's physical as to his spiritual being. In our life's work we have to take hold each of us in our own way; what we gain an insight of—that is, the practical part or detail—is not much of it adaptable to others. "Live and

learn, die and forget it all," I used to think a hard saying of my grandmother's, but have grown to realize its deep wisdom and truth. Especial cause have we to remember it this spring at Clovernook in the mating of our Pekin ducks. Heretofore we have separated our breeders in October and wintered them in one flock. Last fall we had so many that in December we divided them into two flocks and yarded them separately. This February we picked from among them a choice Hallock drake and penned him with five of our largest ducks. Their eggs we



69—GROUP OF CHOICE PEKINS

kept separate to hatch out in a pedigree tray. At the first test we had four fertile eggs out of the twenty-two! The balance of our eggs rated nine infertile out of one hundred and eighty eggs. Again we put the two flocks together and the egg yield promptly advanced twenty-five per cent.

If the points thus submitted are correctly understood, the natural inference would be that if each drake and his five ducks were separated in the early fall and kept yarded separately for a few weeks there would be secured a decided benefit to the spring output, and the importance of not disturbing the breeders after the fall round up would be emphasized.

The ration of our breeders during "egg time" is: Two measures of corn meal, one and a half measure of ground oats, one and a half measures of wheat bran, and a half measure of beef scraps. To this is added about one-fourth the bulk in green stuff. At noon there is scattered to them two measures of whole corn, oats and barley (mixed). They are yarded until noon when they go to the river for the balance of the day. Of course plenty of water, sand and grit is always before them.

I have grown to have a decided respect for ducks, because they know so much and so quickly show up our mistakes. No fowl responds so promptly to care or neglect. A slight change in the first "tells the tale" in a week or two. For example, I ordered a shipment of ground oats; they sent me instead what we call "provender," a mixture of everything, mostly shucks. In less than two weeks the egg yield dropped one-third and it took two more weeks to bring it back to its original standard.

Evaporation is so rapid in our section (the Adirondack region) that in order to get best results from our incubators when the hatch is on we have to shut up the incubator room three or four times during the last forty-eight hours and with boiling water sprinkle the floor around the machines. We use

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two quarts each time and open up the room in about a half hour. During the last two weeks of the hatch we also sprinkle the eggs; otherwise the shells have a dry, feverish, brittle feeling, and the ducklings cannot seem to break through them. The skin is tough and leathery and in many cases the inner wrapping dries and mummifies the birds.

We find that a comfortably heated brooder house is of more importance than to have their little brooder at any exact temperature. This latter must, of course, be comfortably warm; but lots of bother and loss have been saved us of late by a good stove running steadily all the time. When the ducklings run out of their warm bedroom to feed or drink, they are chilled or troubled with rheumatism or cramps. Again we do not hurry them out of the incubator, but let them get well dried off and when we do change them to the brooder, for the first twenty-four hours we place only water and sand before them. Their water is tepid and the food is—well, sometimes one thing, sometimes another. Just now they are getting bread crumbs soaked in milk and dried to crumbly consistency with corn meal and wheat bran. After they are a week old we give them either a

little fine chopped, hard boiled egg, or well soaked beef scraps. We put before them only what they will eat up clean and after the first two weeks feed four times a day until marketed.

For the second month their ration is one-third corn meal, one-third wheat bran, one-third ground oats and gradually work up from one-fifteenth of beef scraps to one-tenth, which continue until marketed. To the above we add one-fourth in bulk of fine cut green stuff, preferably clover. During the third month the proportion of corn meal is gradually increased until it is about three-fifths to three-fourths of the food given. We also shorten up their yards.

When raising ducks on a small plant it is a good plan—when the ducks are being prepared for market—to have the coarse feathers (of wings and tail) kept apart and the fine feathers and down picked together and spread in a clean, airy place to cure, which takes about a month. These feathers may be sold to the local trade at from 60 to 75 cents per pound; five ducks usually yield about one pound. They may also be made into sofa pillows and a little advertising of this is all that is necessary.

FEEDING FOR MARKET OR BREEDERS

FEEDING NURSERY DUCKLINGS—FATTENING THE DUCKLINGS—FEEDING STOCK DUCKS—FEEDING THE BREEDERS—HINTS IN REGARD TO FEEDING FOR EGGS

H. E. MOSS



THE duck farmers of this country who conduct the business on a commercial scale are, so far as feeding methods are concerned, far in advance of those engaged in any other branch of the poultry business. They have reduced the feeding question to what may be called a certainty if not a science. They have every branch of it from start to finish under perfect control and while but few of them perhaps would undertake to demonstrate what constitutes successful feeding from a scientific viewpoint, or even undertake to figure the nutritive value of the different feeds, they never-the-less know exactly what to use and what results will follow as well as if they had worked it out scientifically; they have been through the severe school of experience.

The writer enjoys the personal acquaintance of nearly every one of these men, and has visited practically every large farm in this country, and knows what has been accomplished. They do not all feed exactly alike, so far as the materials used are concerned, and it will be found that the best results are obtained by those who approach, either intentionally or otherwise the correct nutritive ratio, the secret of successful duck feeding.

I admit that ducks will eat almost anything, and that after they are ten days or two weeks old they will not only eat, but manage to live and grow to maturity although thrown almost entirely upon their own resources, if given a chance to rustle. But this would not answer our purpose. We must devise a system of feeding that will produce the most rapid growth and greatest weight in the shortest time. The food must be composed of material demanded by the nature and constitution of the duck, and easily digestible; otherwise it will not only be wasted, but may injure or kill the ducklings, which it will if it steps too far out of the narrow path wherein safety lies. Forcing their growth on a concentrated feed is an entirely different proposition from their natural, slower growth on material of their own selection.

FEEDING NURSERY DUCKLINGS

The critical period in a duckling's life is during the first ten days of its existence. The handling and care during this per-

iod determines whether or not they go to market at a profit

When they are hatched the yolk which has just been taken into the abdominal cavity contains sufficient nourishment to sustain them thirty-six hours or more. They should be taken from the incubator thirty-six hours after the hatch is over, which if properly conducted will be the evening of the twenty-ninth day, as they should be practically all out of the shells on the morning of the twenty-eighth day. They should then as they are transferred to the brooder (and this applies to chicks as well) be taken one at a time and their bill dipped in blood warm water, if they get only a drop it will be found that this will prove the means of saving many that would otherwise suffer and perhaps to a degree that would later on prove fatal; for one drop of water at this time will so aid the assimilation of the yolk that must take place, or should before any food is taken, that many deaths from unabsorbed yolk will be prevented. This takes time, but it pays to do it.

Of course ducklings quickly find the water, but there are always a few that do not until it is perhaps too late to save them. Both ducks and chicks when hatched can wait seventy-two hours before taking food and I believe to their advantage, but they must not be deprived of water.

The first feed should consist of stale bread crumbs soaked in skim milk and squeezed dry with the least bit of fine sand sprinkled over it. This should be kept constantly before them day and night for the first forty-eight or sixty hours, renewing it every three hours. This has the effect of thoroughly cleansing the entire digestive tract of all acid and urate accumulations and fitting them for the rapid and active work they must now take up, for without a ravenous appetite and perfect digestion they cannot reach the stage we desire. I shall not go into the details of brooding houses and temperature here, but confine myself to feeding alone. I will assume the reader has these details correctly and firmly fixed in his mind and is practicing them.

The next ten days that now follow are the important ones, so far as temperature and food are concerned and those that safely survive this period are not only safe, but far more hardy than chicks at the same age.

Their feed during this period should consist of:

ARTIFICIAL INCUBATING AND BROODING

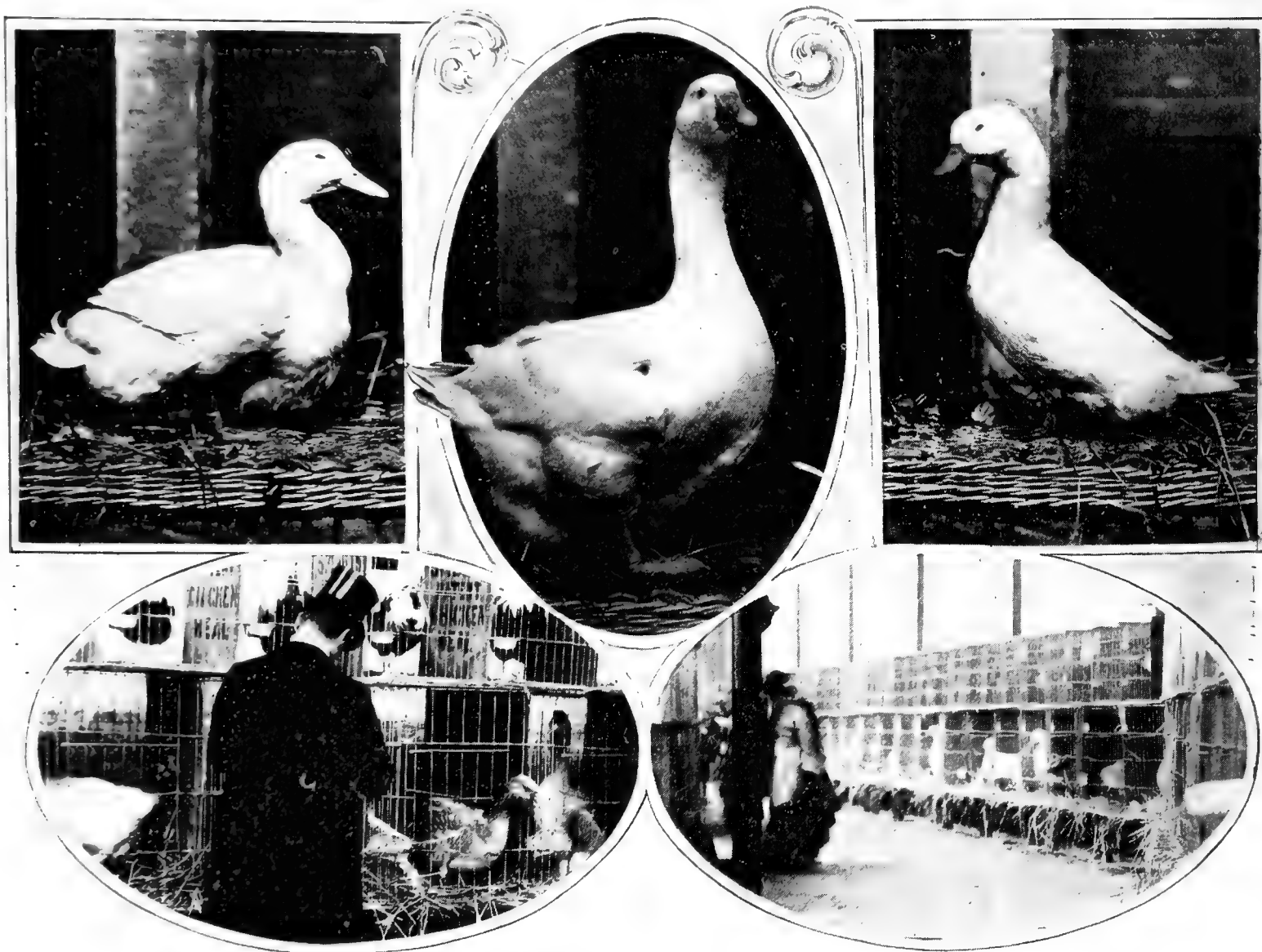
One measure of stale bread crumbs or cracker crumbs;
 One measure of white middlings or pollard;
 One-half measure of fine bran;
 Five per cent of sand.

Wet this with skim milk or water, using only enough to stick it together. Feed four times a day. Scatter it on flat boards, made say one foot by three with an inch strip around the edge. Give them twenty minutes during which to eat; then remove the board.

Keep water before them at all times day and night, but in the nursery always have the chill taken off. Wash the drinking receptacles at each feeding, and if for any reason their pans have been allowed to become empty be sure to give them their food before placing water before them, especially at the first morning feed or colic may result, which is often fatal.

Four measures of fine bran;
 Three measures of white middlings (pollard);
 One measure of corn meal (maize);
 Three measures of fresh cut green clover or rye or two of steamed clover meal;
 Five per cent (of the grain feed) of sand;
 Five per cent (of the grain feed) of beef scraps.
 I prefer to keep water constantly before them, although they can worry along without it except at feeding time.

This ration will not fatten; it is not intended that it should, for to feed any more corn meal at this time would starve the bone, muscle and feather growth and they would soon be crawling on their bellies broken down or throw their heads back and fall in a fit, which usually ends fatally and is the sure result of feeding a too highly carbonaceous or fattening and heating



70—WATER FOWL AT THE LONDON DAIRY SHOW

They will scatter considerable water on the bedding around the drinking fountains and will also drop particles of food on it; this soon becomes sour and the wet portion should be renewed every day, otherwise they dig in it and eat it to their injury.

GROWING DUCKLINGS

At the end of ten days they are transferred from the nursery to the brooding house proper. Here they are given more room and also outside runs to exercise and sun themselves in, but where both sun and shade are found. We now aim to grow all the frame and muscle possible until they are seven weeks old, and we feed them four times a day until they are five weeks old, and then three times a day the following, mixed as before:

ration. There is plenty of time to fatten them after the frame is grown, which at seven weeks old, has been sufficiently accomplished to permit it. When they reach this age we select the most precocious and promising ones for the next season's breeders and turn the others into the fattening sheds.

FATTENING DUCKLINGS

In these sheds are fed three times a day on the following mixed as before:

Two measures of corn meal (maize meal);
 Two measures of white middlings (pollard);
 One measure of bran;
 One measure of cut green clover or rye;

HATCHING AND BROODING OF DUCKS

Ten per cent of beef scraps;

Five per cent of sand.

They remain here until they are between nine and ten weeks old, when they are ready for market. They of course must have shade and a constant supply of water in these sheds. As the weather grows warmer they will eat much less at noon than at morning or night, but here as well as in the brooding house be careful and do not overfeed.

It is better to leave them a little hungry than to overdo it. Twenty minutes is time enough for them to eat all they should and whatever is left must be removed. Ducklings fed in this way should weigh from ten to twelve pounds per pair at this time.

Do not keep them longer than ten weeks. Let this be the limit, for they then begin growing their adult plumage and the pin feathers that now start will make them very difficult to pick properly or rapidly; and as all their strength will be employed in growing this crop of feathers they will gain nothing in weight during the next six weeks. The feed they consume would be practically wasted, adding so much to their cost that instead of making a profit, they would show a loss.

FEEDING STOCK DUCKS

The birds that are selected to be raised for stock ducks for the next season should be turned into a pasture where there is water and shade. If marshy and swampy so much the better, they will find most of the food they require, but they should be fed morning and night as follows:

Three measures of cracked corn (maize);

Seven measures of fine bran;

Five measures of cut green clover.

If there is no marsh or water in the pasture in which they can find bugs and worms there must be five per cent of beef scraps added to this feed.

They remain in this pasture until late in the fall and the quantity of food given them must be governed by the quantity they are able to pick up on the range.

This feed does not encourage egg production in the fall, which we try to avoid. Should a few begin laying, cut down the feed. It is not desirable to have laying begin until Christmas, but April hatched ducklings will if encouraged lay a few eggs in October and November. They will be largely infertile and too far out of season to serve our best purpose.

THE BREEDING STOCK

Latitude and markets will vary considerably the time when it is desirable to make up the breeding pens, but generally the first of November is early enough for any locality. The birds are then divided up in pens with twenty-five females to five males in each. Feeding for eggs should be started three weeks before we wish them to begin laying and we have them so well under control that this will result on the following feed:

Five measures of cracked corn;

Five measures of fine bran;

Two measures of white middlings;

One and one-half measures beef scraps;

Three measures of boiled potatoes or turnips;

Three measures of cut green clover or rye.

If the winter should be very severe and there is an excessive demand upon the birds for fuel to keep up their internal fires, the quantity of corn meal must be slightly increased to provide it. They will not fatten unless they are fed an excess above the demands made for fuel and energy. The feeder must use judgment in this and increase the quantity when conditions demand it. Avoid fattening, but put all the flesh on them possible. No fowl can or will produce eggs if in poor flesh, but flesh and fat are two entirely different products. Carbonaceous food produces fat and supplies heat and energy; it is fuel, and any surplus is stored as fat for future use. Protein produces flesh, bone and feathers and has other important uses in the vital processes going on within. To supply the necessary amount of both is what we attempt and the above formula will answer as a basis, to be varied only in extreme weather as directed.

The formulas I give above are those I have used in my own work and the result of a wide experience. They are correct both in theory and practice.

In addition to above I wish to add that it is advisable to keep a box of ground oyster shells in each pen of stock ducks, and also to feed a lunch of about a quart of whole corn at noon to each pen during the laying season. When this is done the corn in the mash may be meal instead of coarse cracked. The idea is to give the gizzard some work to perform to keep the digestive organs in perfect health.

Watch the birds closely and see that they come up ravenously hungry at each feeding. The more they can eat and digest properly the more profitable they become.

In mixing mashes for poultry of all kinds there should be added at the rate of one pound of salt to every hundred pounds of grain except for the newly hatched birds in the nursery.

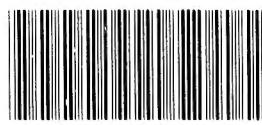
Should there be any indications of bowel trouble at any time, use a little powdered charcoal in the mash for a few feeds and it will correct it. Keep the yard clean and free from puddles of filth and feed only the best material and at regular hours and no such trouble need be anticipated.

TESTING DUCK EGGS

Duck eggs should be tested more frequently than hen eggs. Three or four tests during the hatch being necessary, the first test may be on the fourth or fifth day, when the embryo duck can be readily seen through the clear shell of the egg, if a good tester is used. After the first test a few eggs should be examined every day or two, to see how the hatch is progressing, and if any foul odor is noticed on opening the machine, the rotten eggs should be tested out and removed. For the beginner it will be necessary to examine the eggs with a tester or else "smell them out" in order to find the eggs which give rise to the foul odor. An expert operator can tell the putrid eggs by the changed appearance of the shell almost at sight; for, as a rule, the putrid egg shows a slightly bluish or discolored, marbled appearance on some portion of the shell, which is not found in the eggs containing live, healthy germs. Duck eggs become putrid very quickly after the germ dies, and give off foul gases which endanger the lives of the little birds in remaining eggs.

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