Price 25 Cents.

THE POULTRY KEEPER SERIES.

No. 3.

MANAGEMENT OF YOUNG CHICKS.

BY
P. H. JACOBS,
EDITOR OF
THE POULTRY KEEPER and FARM, FIELD AND STOCKMAN.

PUBLISHED BY
W. V. R. POWIS,
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CHICAGO, ILL., U. S. A.:
1884.

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TO THE READER.

In presenting the POULTRY KEEPER SERIES the author has considered it proper to arrange the subjects under appropriate titles, thereby believing the readers will be better enabled to select those portions which directly interest them. It is much better to present different subjects in separate works, at a small cost for each, than to refer to a larger volume containing much that may be foreign to the reader's requirements. As the author has devoted many years to the study of poultry, and also interested himself in breeding nearly all the varieties, as well as conducted numerous experiments, he sincerely trusts that the readers will reap many times the cost of this work, and that each and all may be successful.

Respectfully,

THE AUTHOR.

—:o:—

THE EGG AND THE CHICK.

In this little book, which we devote entirely to the management of young chicks, we think it proper to begin our subject with the process of incubation itself. Everyone knows, says an eminent authority, that an egg is composed of yolk and white in a thin membrane, all enclosed in a shell very brittle and of various colors. The yolk is composed of blood assimilated through the working power of the hen, and a proportion of oil drawn from the grain she eats. The white is a thick mucilage derived from the green or vegetable portion of her daily diet, while the membrane or skin is made from the woody, fibrous substance of the same. The yolks, or ova, grow in a cluster on the spine, and pass through a tuft of soft skin between the lungs and the kidneys, one being formed every twenty-four or thirty-six hours while the hen is laying, which is enclosed in a very thin skin. On the maturing of the yolk this skin breaks, letting it drop into the mouth of a funnel-shaped duct, in length from fifteen to twenty inches, consisting of three divisions, the terminus of each being an elbow. The inner side of this canal is very soft and pliable, being composed of folds lapping partially over each other, the last division being very much finer in texture than the others. While passing through the first division, the length of which is five inches, the yolk makes three distinct revolutions and the white is put on in the same number of layers. In the second, the same length as the first, the yolk, with the white around it, gets its shape from the rotary motion of its course; and also the membrane which encloses it; while in the third division the shell is received, which is a thin fluid, in color to suit the breed. At the turning of this division the duct is globe shaped, and here the egg turns and comes out big end or head first. The egg is fertilized by the influence of the male bird, which passes through a small duct along the spine of the cluster of small ova. The yolk is suspended in the center by two spiral cords, one end being attached to each end of the yolk, the other end, passing through the white, being fastened to the membrane lining the shell. These cords are laid

"right and left handed," thus holding it with the heavy side down, no matter in what position the egg may be held or placed. The chick is formed entirely from the white, and here we see the use of the three revolutions, in the first division. The first layer forms the bone and sinew, the second the flesh, the third the skin and feathers. The first part formed is the eyes, appearing as two black specks, one on each side of the suspending cord at the large end, next the skull bone between, and in order the neck, spine, legs and wings. At nine days there is a complete circulation and life, and at fourteen days the white is all taken up. The cords have now made a connection in the stomach and protrude from the naval in a number of blood vessels and enclose the yolk in a network of smaller ones, and through these the chick draws its nourishment from the yolk, transformed to its original substance, blood. After the shell is cracked, and the chick has gained strength, these two large blood vessels draw into the belly what remains of the yolk, the naval is closed, the course is all clear, and having cracked the shell all round, the little creature gets its head against one end and its tiny feet against the other, the parts separate, and out rolls the chick.

The subject may be further discussed with interest. According to the views of experienced investigators, the productive powers of a hen depend upon her constitutional capability and the feeding. The statement that a hen has a certain number of germs of ovules in the ovary at birth, and that these mature during certain periods of her life, is simply bosh. It is a baseless, imaginary supposition, and quite inconsistent with what is known as the laws of animal growth. If these 600 ovules exist, at what time were they formed? They must have existed in the young chicks, and if so, they must have been in embryo in the eggs. This is not possible. It might as well be said that every fat globule in the milk of a cow has been numbered and provided for at the birth of the calf, because these globules are produced by cell growth in precisely the same manner as the ovules in the ovary of a hen. It was once said, years ago, that the whole of a tree existed in embryo in the seed—the roots, stem, branches and leaf. This is a parallel misstatement to that in regard to the hen. The absurdity is apparent to anyone who thinks about it, and one is as absurd as the other. The fact is the hen at birth has no apparent ovules, nor is the ovary fully formed. This grows and matures as the chick grows and increases in age and size, from the ordinary cell growth, by which the bone, muscle and other parts of the fowl are produced from the blood, which is made from the food. The food is eaten and digested and changed into blood; the blood forms the matter from which the cellular tissue of the animal is built up. If

the food is not sufficient for all the wants of the animal, its life is first sustained, then its sustenance is added to, but its reproductive functions are not completed or set in action. For this full purpose of a living creature, whether plant or animal, full and sufficient nutriment must be provided. A hen will not lay eggs unless fully fed, simply because the ovules in this ovary cannot be formed without the necessary substances, which must come from the blood. And these ovules are formed by an abundant growth of tissues in proportion to the supply of food. The better a hen is fed, and the more judicious care bestowed upon her, the more eggs she will produce. As some hens have been known to lay over 2,000 eggs in the course of a long life, it is very clear that a large number of ovules must have been produced somehow, although she was provided with 600 at her birth. The whole statement is one of those foolish "facts" of "popular" science of which so many are turned out of the science mills. Common sense is very much needed in the investigation of every subject; and it is a great pleasure to observe that truth is being elicited from day to day, and ignorance and superstition are gradually passing away; yet, despite the claims of those who take the above view, others maintain that the hen has in her ovaries, in round numbers, more than 600 egg germs, which develop gradually and are successfully laid. Of these 600 the hen will lay twenty in the first year, 135 in the second year, and 114 in the third. In each one of the following four years the number of eggs diminishes by twenty, and in the ninth year she will lay at most ten eggs. In order to obtain from them sufficient product to cover the expense of alimentation, they should not be allowed to live over four years.

The Demand For Chicks.

Before going further we will state that the fear on the part of some is that the market for poultry and young chicks may be overstocked, and that prices for chicks, fowls and eggs may become so low in price as to be unprofitable. Such has been the claim for fifty years. When the railroads began to branch out in every direction and open new avenues to market, it was thought that everything would fall in price, and provisions be much cheaper. Turkeys were then driven to market on foot, and so were hogs and sheep. Eggs could be bought for six cents a dozen in some places, and even in winter fifteen cents was considered a high price. At the present day there is no section of our country that is without railroad facilities, and yet we are not overstocked. Overstocking the market is not an easy matter. It requires organized effort to do so, and with all the

schemes and plans that may be made for so doing, the market only remains in such condition for a day or two. If all the farmers around Chicago should combine, and each keep 1,000 hens, with incubators to assist in hatching the chicks, the Chicago market could not be overstocked a week. Let it be remembered, too, that Chicago is but one of the number of markets that are open to the sale of poultry and eggs, to say nothing of the increased demand which is always occasioned by an unlimited supply.

The poultry market cannot be overstocked. The greater the number of eggs sent to market the larger the number of purchasers. In proportion to cost, eggs are higher, as a usual thing, in price than any other production of the farm. Despite the increase in numbers of those who are engaging in the poultry business, the supply falls short of the demand, and the greater the attempt to fill the demand the wider the difference between supply and demand, as may be proved by the fact that, although there is now more poultry and eggs produced than in former periods, we are compelled to import eggs from Europe in order to satisfy those who are willing to purchase. There is no such thing as overproduction. True, there may be times when large quantities may be shipped and remain in market for a short time, being slow in selling, and depressing the price somewhat, but the market not only reverts to its normal condition, but the excess sent forward causes a corresponding reaction, which not only enhances prices but elevates the apparently overstocked market to one demanding a greater supply. Production creates demand. The natural law which prevents an oversupply except at the expense of an undersupply in another direction ordains that the extra demand for a certain article lessens the demand for another, and consequently the purchasers who may be added to those preferring poultry are taken from those who formerly were purchasers of substitutes, which rule governs the production and sale of commodities all over the world, and in thus admitting that there may be overproduction of some articles there will be no overproduction of all, and at no period can necessary articles of food be sent to market in excess without at some future time finding common level. As a scarcity arises it attracts attention and thus enables us to maintain an equilibrium on all productions, but *too much cannot be produced.*

Then, again, if too much can be produced, which may be admitted for comparison, there is never, nor can be, an excess in *quality.* Good poultry will sell, even if every storehouse and market stall be piled up with carcasses. Buyers not only demand a supply,

but they are willing to pay well for the best. If poultry is to be made a business, therefore, it is apparent that a small investment for a sitting of eggs from a good strain of pure-breds is but a drop in the ocean as compared with the profits to be derived from the increased price which poultry of good quality always brings.

The Foundation of Success.

The foundation of success in hatching young chicks, either under hens or in incubators, is vigorous, healthy parents. Many parties collect eggs from anywhere and everywhere, whether the season be cold or warm, and attach the same value to all, provided the eggs are *fresh*. That is a point few overlook—the freshness of the eggs—but while it is essential that the eggs be fresh, yet it is still more important that they be procured from stock of good quality and full of vigor.

Eggs from fowls confined in yards, no matter how well provided for the hens may be, will not hatch as well as those from hens that are in the full enjoyment of liberty and with unrestricted range, nor will eggs from very fat hens give as good results as those from hens in moderate condition. The eggs from pullets do not hatch as well as do those from hens, and the eggs from hens mated with large, coarse, clumsy cocks are not always as satisfactory as those from flocks headed by an active, light and attentive cock. Eggs that have been exposed to severe cold are sometimes useless, while those from hens afflicted with even the slightest ailment may at times disappoint the poultrymen.

Everyone who desires to raise chicks for market, if he expects to buy eggs, should personally attend to the improvement of his neighbor's flock. The plan adopted by the writer of this proved a successful one, and may be put in practice anywhere. Desiring to raise broilers for market, using incubators for that purpose, the principal difficulty was not only to get good eggs but to procure them from suitable stock. Having a flock of two hundred fine, well bred Plymouth Rocks, of which a large proportion were fully developed, vigorous cockerels, those suitable for the show room were sold at fair prices. The remainder, though equally as good as those sold, were deficient in a few insignificant points, such as a twist in the comb, or a black or white feather on an undesirable portion of the body, which defects, while debarring them from competition for prizes, in no matter detracted from their merits as suitable cockerels for crossing on common hens. Noticing that our neighbors, though willing to use pure-bred stock, were not partial

to paying a fair price for cockerels, we quietly went among them and offered to trade Plymouth Rock cockerels for scrub cocks. Our offers were always accepted, and our neighbors intimated that they would be happy at some time to show their appreciation of such neighborly kindness on our part. We replied that we asked no compensation except that when they had eggs to spare they would allow us the first opportunity of purchasing them, as we were willing to pay as high a price for them as could be procured elsewhere. They did not see any imposition in our modest request, and agreed to oblige us. Thus, we displaced their scrub cocks, which we sent to market, and were able to procure eggs that would hatch chicks one-half Plymouth Rock, to say nothing of the fact that we received flattering compliments for our liberality in exchanging pure-breds for scrubs, while it is apparent to the reader that our real motive was a selfish one. However, as we conferred benefit on our neighbors, also, no doubt our selfishness was tempered with a trace of justice. The incident is mentioned here as a case showing that one can "love his neighbor as himself" in a manner conducive to both morality and profit, and is certainly applicable to our readers who desire to procure eggs from the best stock. It will pay to buy eggs of pure breeds and give the cockerels to your neighbors every season.

Feeding Chicks.

In our former two books in this series, "Poultry for Profit" (No. 1) and "Incubators and Brooders" (No. 2), we gave full directions for the management of sitting hens and incubators, as well as much that may be useful to many in regard to the management of young chicks, and hence we are somewhat restricted in order to avoid inflicting the reader with repetitions.

It is well, however, to lay down a course of feeding for the chicks from the time they emerge from the shells to the time when they are sent to market. Before doing so let us notice the fact that all kinds of food have their special functions. Some are fat-producing, and do not supply sufficient phosphates and lime for the bones. Others are deficient in nitrogen, and do not furnish nutrition for the muscles, feathers and internal structure. Hence, a young chick may starve in the midst of plenty simply because it is deprived of some particular element which the system demands. Whenever this occurs, disease of the bowels is the result, and for the first four weeks the chicks must be fed *early*, *late*, and *often*, and on a variety of food. When we state that they must be fed early no doubt some may object, but if chicks are to be made to *pay*, our

readers must be as willing to jump out of their beds on a cold morning, for the purpose of feeding them, as to get up at an early hour in order to attend to the horses, cows, or other stock. It is *business*, and demands attention. Another reason for feeding them early is that there is a long period of time between supper and breakfast during the winter months, and the more we shorten that interval the better for the health of the chicks, and the faster they will grow. Hence, in our bill of fare we fix the times, assuring our readers that it is just as important to observe *regularity* in feeding as in the manner in which it is done.

Preparation of Food.

Before stating *how* to feed we advise our readers to keep on hand, always ready for use, a few of the following preparations, which can be made cheaply, especially if one of Wilson's bone mills is used, the price of which is only $5.

Preparation No. 1.—One pound wheat, one pound corn, one pound oats, one pound buckwheat. Parch the whole until very brown, and then grind the mixture to a fine powder. Now add to it half a pound of finely ground bone, half a pound ground charcoal, half a pound chalk, and two tablespoonfuls of common salt.

Preparation No. 2.—One pound fine bone meal, one pound chalk, one pound ground meat, and one ounce each of salt, sulphur and finely ground carbonate of iron.

Preparation No. 3.—Mix five pounds clean oats, five pounds wheat, three pounds corn, and two pounds buckwheat. Grind the whole together.

Preparation No. 4.—Mix ten pounds clean oats, five pounds corn, five pounds wheat, three pounds buckwheat, and one pound charcoal. Grind the mixture fine, and add one pound chalk, one pound bone meal, a quarter pound of salt, and five pounds coarse bran.

Preparation No. 5.—One pound oatmeal, one pound rice, one pound corn meal; the mixture to be well cooked until thoroughly done. Then add one quart of milk, and let it boil down till quite thick, so that when cold it may be crumbled into pieces. If it burns, scorches, or dries too much, no harm will be done.

Preparation No. 6.—One pound bran, one pound shipstuff, one pound buckwheat meal, one pound oat meal, one pound corn meal, one pound crude tallow, one quart milk, one ounce salt. Cook well to a stiff mass.

Preparation No. 7.—Three eggs (well beaten), one quart milk,

and one tablespoonful of salt. When it comes to a boil, thicken to a thick mass with oat meal and corn meal mixed.

Preparation No. 8.—Cook enough rice in a pint of milk to make a paste. Then add one egg (well beaten), a teaspoonful of tincture of iron, and while boiling add enough of Preparation No. 1 to thicken it to a crumbly mass when cold.

Preparation No. 9.—One ounce tincture of iron, one ounce paregoric, and one ounce tincture of camphor.

Preparation No. 10.—One ounce tincture of iron, one ounce tincture of camphor, one ounce tincture of cayenne pepper, and one ounce paregoric.

Preparation No. 11.—One pound fenugreek, one ounce ginger, one ounce sulphur, one ounce carbonate of iron, and one ounce chalk.

Preparation No. 12.—Equal parts of castor oil and glycerine.

The above preparations have their special purposes, which will be explained as we proceed, and it may be stated that the poultryman should also lay in a supply of such articles as may be required for use from time to time in the shape of medicines, stimulants, etc.

Ground bone meal for chicks may be procured of any seedsman, especially from those in the large cities. Ground meat is the refuse of soap-boiling factories, from which the fat has been extracted, and the meat ground to a fine condition.

Bill of Fare.

The chick comes from the egg full, nature having made preparation for its nourishment for at least twenty-four hours, by allowing it to absorb the contents of the yolk just previous to emerging from the shell. Consequently the chicks should not be fed for twenty-four hours, and thirty-six hours will be no inconvenience.

SECOND DAY.

Begin feeding as early as possible. Five o'clock is an excellent time to fix upon, but if at four o'clock so much the better. Some poultrymen get up early and feed by the light of a lamp.

The second day, however, is not so urgent, and feeding need not begin until eight o'clock. Give hard boiled eggs, white and yolks mixed, finely crumbled. Place the shells in a stove, let them dry, and then crumble and give them also. At noon give the same food, but place a little milk where they can reach it for drinking. No water will be necessary. At four o'clock do the same, and also at eight o'clock. Be sure and keep a plentiful supply of gravel on the floor for them, which should be very fine and mixed with sand.

THIRD DAY.

Be careful to keep the floor clean by cleaning it off every night and morning, for such is *indispensable to health*, and never omit the sand and gravel. At five o'clock give hard boiled eggs as before, with the milk for drink. At eight o'clock give stale wheat bread crumbs. At twelve o'clock give corn bread crumbs, at four o'clock give wheat bread crumbs soaked in milk, and at eight o'clock give hard boiled eggs as before. Here it will be noticed that we are beginning to omit the eggs, which will cause disease of the bowels if persisted in. Let the food be cooked except the milk, which should remain convenient, all the time, in little vessels that permit the chicks to drink without walking in it or in any manner getting themselves wet.

FOURTH DAY.

At five o'clock give No. 6. At eight o'clock give mashed potatoes. At noon give No. 1 (scalded). At four o'clock give No. 8. At eight o'clock give No. 3 (scalded).

FIFTH DAY.

At five o'clock give No. 5. At eight o'clock give No. 4. At noon give No. 6. At four o'clock give No. 7, and at eight o'clock give No. 8.

SIXTH DAY.

At five o'clock give No. 4 (scalded but cooked is better always) to which may be added a little chopped onion. At eight o'clock give No. 5, with a little chopped cabbage added. At noon give No. 1. At four o'clock give nothing but a little chopped meat. At eight o'clock give No. 1. Be careful to scald the dry food with boiling water, or cook it a little every time it is fed.

SEVENTH DAY.

At five o'clock give No 5. At eight o'clock give coarse oat meal or screenings. At noon give No. 1. At four o'clock give a little chopped meat. At eight o'clock give No. 7, mixing with it some finely chopped onion.

EIGHTH DAY.

The chicks will now begin on their second week, and the eight o'clock morning meal, and four o'clock afternoon meal, may consist of coarse oat meal, sorghum seed, screenings, or any kind of small grain or seeds, using whole wheat as soon as the chicks are old enough to swallow such. Once a week cracked corn may be used, and with every meal of soft food give chopped cabbage and onion. At five o'clock give mashed potatoes, thickened with No. 1. At eight o'clock, small grain, as mentioned above. At noon give No. 4. At four o'clock, grain, as mentioned, and at eight o'clock give No. 6.

NINTH DAY.

Be careful to add the cabbage and onion to each meal. At five o'clock give No. 8. At noon No. 3. At night No. 7.

TENTH DAY.

At five o'clock give No. 1. At noon give No. 4, and at night give No. 5.

ELEVENTH DAY.

At five o'clock give No. 6. At noon No. 8, and at night give No. 4.

TWELFTH DAY.

At five o'clock give No. 8. At noon give No. 4. At four o'clock give a little chopped meat, and at night give No. 6.

THIRTEENTH DAY.

At five o'clock give No. 3. At noon give No. 8, and at night give No. 7.

FOURTEENTH DAY.

At five o'clock give No. 1. At noon give No. 5, and at night No. 6.

We have given a bill of fare for the first fourteen days, and have varied it some, though endeavoring to make it as nourishing as possible. Our object in thus varying it is to avoid disease of the bowels, and also to supply the system with all the elements that may be required. We suggest cooking the food for the reason that raw meal of any kind is injurious. It may seem troublesome to resort to so many preparations, but we simply suggest them, though the ingredients only need be kept, so that they can be mixed as required. Where hundreds of chicks are raised, however, it will be found convenient to have the articles ready prepared.

In suggesting green food we do not confine ourselves to cabbage and onions. Good tender grass, when it can be procured, cut into half inch lengths, is excellent, and in winter good clover hay, cut in the same manner, mixed and scalded with the soft food, will be excellent. Turnip tops, kale, early rye, lettuce, or any green food, will answer. A beet, turnip, or carrot, chopped fine, and fed raw, is relished at times. It is the *variety* that keeps the chicks in health. The grain may be changed as frequently as possible. Sorghum or broom corn seed may be substituted for screenings at periods, and also pop corn. Cracked corn should be given twice a week. Whole wheat and buckwheat may be given as soon as they can eat such. Instead of giving a bill of fare for days we will suggest one for weeks, and mention that milk, though excellent, may be omitted as drink when fed in the soft food, if preferred. Although we did not so state above, yet the eight o'clock, morning, and four o'clock afternoon meals should be of grain.

THIRD WEEK.

Give No. 8 in the morning, to which should be added green food. At eight o'clock give grain. At noon give a tablespoonful of No. 2, with mashed potatoes, for twenty chicks. At four o'clock give grain. At night give No. 6.

The above is for the first day. The second day give No. 4 in the morning, with green food. At eight o'clock grain. At noon give mashed turnips (or potatoes) thickened with No. 1. At four o'clock grain, and at night give No. 7.

Alternate the two methods, using one the first day and one the second, and continuing until the end of the week, when the chicks will then be three weeks old.

FOURTH WEEK.

Give No. 8 every morning. At eight o'clock grain. At noon give mashed potatoes or turnips thickened with No. 3, with a tablespoonful of No, 2 to twenty chicks. At four o'clock give grain, and at night give No. 6. Always add green food to the noon meal, but omit it in the others. At night add a teaspoonful of ground meat for every ten chicks to No. 6. Three times a week a small piece of beef, or liver, may be chopped fine and boiled with the mashed potatoes.

FIFTH WEEK.

Give the same except to substitute No. 5 for No. 8. At noon use No. 1 and No. 3 mixed. No. 2 may be also used with No. 5. This diet may be continued until the chicks go to market.

Hints During Feeding.

Never feed on the ground, but always on a clean surface, which will prevent gapes and other diseases. Little troughs are best, which should be shallow, and low enough for the chicks to eat without difficulty. Be careful to clean out the troughs as soon as the chicks have finished their meal, as any excess of food left over will ferment quickly and generate disease.

No fixed quantity can be estimated as to how much a chick will eat. A healthy chick will eat more than a sickly one. The proper course to pursue is to give them as much as they will eat up *clean* at a meal, care being taken to remove the surplus, except the grain, which they should scratch for.

In winter but little water will be required, but it should be provided plentifully in summer. It should never be allowed to freeze, nor should the chicks tread in it, or soil it in any manner. The vessels should be so constructed as to allow them to drink at a small aperture only.

When the chicks are raised in brooders they may be called to their feed by giving a few raps or taps on the bottom of the brooder. They will understand the call before they are two days old.

Put ten drops of tincture of iron in every pint of the drinking water as a tonic, and change the water morning and noon.

Should the chicks show signs of costiveness of the bowels, by the vents clogging up, wash the parts in warm water, and anoint with No. 12. Give the sick chick three drops of No. 10, and if it does not improve give one-quarter of a teaspoonful of No. 12. The sick chicks should be separated from those that are healthy.

In cases of looseness of the bowels, with scalding of the rear parts, wash the parts with warm water and anoint with No. 12. Then give one-quarter of a teaspoonful of No. 12 with three drops of No. 9, and add a pinch of No. 11 with the soft food, three times a day until the chick is well.

Should the whole brood show signs of diarrhœa feed on No. 8 in preference to other preparations, and if the chicks do not improve within twenty-four hours give No. 1 in the morning, No. 5 at noon, and No. 8 at night, but when thus dieting leave out the green food, and add a teaspoonful of No. 11 for twenty chicks. Should no improvement take place add also a teaspoonful (to the night meal only) of No. 10.

Should constipation attack the brood, feed three times a day on a mixture of mashed potatoes and turnips, to which finely chopped onion is added, and thickened with No. 1.

Many of the bowel diseases arise from colds. If a chick once becomes chilled it never recovers from the shock, and the effects of cold are charged to the feed, when in fact it is due to the chick becoming exposed at some time or other.

About 90 degrees is the proper temperature for a brooder, and the heat should never get over 100 nor below 70.

A few chicks together will thrive and grow faster than when crowded. One-half the failures are due to crowding. In a majority of cases the chicks trample the excess of number to death until the minimum is reached, and the poultryman should save them the trouble, and himself loss, by reducing the number together to the lowest possible number in the first place.

Should you at any time find a dead chick in the brooder when visiting the chicks in the morning it is an excellent indication that the chicks are overcrowded.

A brooder may not be overcrowded the first week and yet be overcrowded the second week, as *growth* accomplishes that which *numbers* fail to do.

Not over fifty chicks should be placed in a brooder, and they should be gradually thinned out as they grow until finally fifteen chicks of fair size are allowed to remain.

In feeding if you notice a struggle on the part of some to reach the feed provide more troughs. The accommodations should be ample. A few small troughs, placed at different parts of the brooder, are better than one long trough.

Dampness is fatal to chicks, even when very slight. Consequently the surroundings of the drinking vessels should be dry, as well as the floor.

Always keep sand and fine gravel sprinkled over the floor, as well as a little ground bone and oyster shells.

Cold boiled rice is one of the best of foods for bowel disease.

A little tallow added to the soft food is excellent for chicks if given two or three times a week.

Chicks raised in the house entirely, provided everything is kept clean and pure, will thrive better than those that run out, especially if supplied with a variety of food.

Top heat in brooders is better than bottom heat, as bottom heat conduces to leg weakness, but the chicks will crowd with top heat unless it be supplied to every part of the brooder. The floor, however, may be kept slightly warm.

The best way to feed grain or seeds is to have a box, about one or two inches deep, filled with dry earth, over which the grain should be scattered so that the chicks may scratch for it. Chaff, sawdust and finely cut straw are also excellent. As long as the chicks *scratch* it is good evidence of thrift. Always endeavor to make them *work* if possible.

Finely cut straw makes an excellent bedding at night, and the same may be said of *dry* dirt.

Never let a chick go too far from the brooders on cold or damp days, as they are liable to become chilled and perish before they can return.

If the soft food (as the different preparations here given are styled) be mixed and cooked into cakes, the same as bread, it will be more wholesome than when fed in a soft condition, but No. 8 may be fed with advantage in a somewhat softer condition (using milk) as a change of diet, whenever preferred; or the soft food consisting of potatoes will answer.

A mess of boiled beans, thickened with No. 1, with a tablespoonful of No. 2, for twenty chicks, given three times a week will be found excellent.

Other Methods of Feeding.

Some divide the day into four parts after the first week, and three parts after the fourth week, but in order to have the chicks grow rapidly they should be fed at least four times a day.

The first day they may be allowed to fast, while the hard boiled eggs may be given the second day. The third day the first meal, at five o'clock, should be hard boiled eggs. The second meal, at ten o'clock, should consist of well cooked rice and oat meal, thickened with enough corn meal to make a stiff dough, the corn meal being added while the mass is boiling. The third meal, at three o'clock, should be shipstuff bread, which is prepared by mixing shipstuff (seconds flour) with milk, adding salt to taste, and allowing it to cook as bread, crumbling it into fine pieces when cold, and if stale so much the better. The fourth meal, at eight o'clock, may consist of the same as that for the third meal, giving milk as drink.

The above diet should continue for the first week. Begin the second week by feeding, as the first meal, the following mixture: Equal parts of corn meal, shipstuff, bran, buckwheat, rice and oat meal. Let the mixture boil until well done and dry, then add one egg, beaten in enough milk to stir well, and again boil until quite thick, and let it cool.

After the second week a regular routine may be kept up. Mix an egg with a pint of milk. While boiling add oat meal, corn meal and shipstuff until it becomes quite thick, and feed for the first meal. Give nothing but grain for the second meal. The third meal should be of a variety, and is prepared by boiling a piece of beef (liver, lights, or any refuse portion will answer) until well done and in fine condition. While it is boiling add potatoes, turnips, finely chopped grass, clover, or anything that may serve the purpose. When well done thicken with a mixture of equal parts of buckwheat meal, oat meal, corn meal, bran, rice flour, and shipstuff. Before feeding add a little salt and red pepper, with a teaspoonful of bone meal to twenty chicks. The last meal may consist of bread made by cooking corn meal, bran and shipstuff together.

Such a diet will answer till the chicks go to market. It is not advisable to give more than one soft mess a day. If preferred a good and cheap bread may be made, which will answer well, provided the potatoes and green food be given regularly. The follow-

ing method of making bread gives a complete food, and will keep for several days. Mix equal parts of bran, shipstuff, oat meal, corn meal, buckwheat meal, and half as much bone meal, intimately together. Place in a pot a quart of beans and a quart of rice, with enough water to cook it well. Add a quart of milk, two tablespoonfuls of salt, a teaspoonful of red pepper, and a teaspoonful of tincture of iron. When the rice and beans are thoroughly cooked add a pound of crude tallow, and slowly thicken with the grain mixture until thick enough to easily crumble when cold. When adding the grain throw in a little fine charcoal or parched bran. It will be best to make the mixture into cakes and bake in an oven. It can be improved if a piece of beef or a little fresh bullock's blood be added to the beans and rice while cooking.

The bread, being well cooked, can be easily digested, and will supply all the requisites of bodily growth. Three times a week a few pinches of sulphur may be given at any one of the meals to a brood. The bread may also be crumbled and soaked in milk as a morning food, and will answer for every meal if the potatoes and green food are given once a day.

As variety, however, is best, it will be found of great advantage to cook rice and milk together and let it become cold. Then crumble it up and the chicks will relish it very much, especially if an egg is first beaten into the milk and a little tallow or suet be added while cooking.

Buckwheat and oat meal are expensive, but it is not necessary to use them singly, but they may be included in the *bulk* of cheaper kinds. Beans and rice are also expensive, but when boiled and the soup thickened with meal they make a large quantity of nutritious and cheap food. One of the prime essentials is that of feeding chopped onion and cabbage raw. An onion, finely chopped, will answer for quite a large number of chicks, and after the second week a proportion of meat, cooked, should be given at least three times a week.

French poultry keepers, according to Boswell, generally cook the grain intended for fowls they wish to fatten. They boil it till the farina swells and softens, so as to burst the enveloping membrane. It is the general opinion that burst grain is better than dry for fattening poultry, and, whether this is founded upon accurate experiment or not, it is of importance to ascertain the difference of expense between the two, and whether more or less is eaten of the one than of the other. To discover this M. Reaumur caused four pint-measures of each of the six common sorts of grain to be boiled

till they were well burst, and he found the increase of bulk in each sort was the following:

	Pint Measures.
Four pint-measures of oats, after being boiled to bursting, filled.....	7
Four pint-measures of barley, after being boiled to bursting, filled	10
Four pint-measures of buckwheat, after being boiled to bursting, filled	14
Four pint-measures of maize, after being boiled to bursting, filled above.....	15
Four pint-measures of wheat, after being boiled to bursting, filled a little more than.....	10
Four pint-measures of rye, after being boiled to bursting, filled nearly	15

Rice swells considerably more by boiling than any of these six sorts, but it is seldom given to poultry, except for fattening, under the notion that it tends to whiten the flesh.

To ascertain whether the boiling altered the liking of fowls for any of the particular sorts, experiments, varied in every possible way, similar to those already detailed, were made by M. Reaumur. The fowls were furnished with two, three, four, five and six different sorts; sometimes all the kinds were devoured alike, and at others nothing but dry grain, and a third nothing but boiled. All that could be collected from these experiments was that the greater number of fowls prefer boiled grains to raw, though there are many of them that show a preference to the dry grain on certain days, and no permanency could be discovered in the preference shown for any sort of burst grain. Some fowls, for example, which one day preferred boiled wheat, would on other days make choice of buckwheat, or maize, or barley, and sometimes, though more seldom, even of rye; but rye, either boiled or raw, is the least favorite sort of grain. It follows, as an important conclusion from such experiments, that we may make choice of the sort of grain which happens to be cheapest, without much, if any, disadvantage; always excepting rye, when other sorts are to be had on reasonable terms.

Other experiments were required to show whether there is any economy, or the contrary, in feeding poultry with boiled grain, and this was readily ascertained from knowing first, how much dry grain sufficed for one or more fowls, and then boiling the same quantity and trying how much of that would in like manner be sufficient. The experiments made with the different sorts of grain were as follows:

Rye, although so very considerably increased in bulk by boiling, instead of being more filling, becomes less so, and more of it is eaten when boiled than when raw. Oats, although increased in bulk nearly one-half by boiling, are not on this account rendered more sufficing for the fowls, which in two days consume four pint-measures of dry oats, in the same period eat seven pints of them when boiled, so that there appears to be no economy in the addi-

tional trouble. Mowbray says that oats have a scouring tendency, although they are recommended as promotive of laying, and in the south of England are much used for fattening. Buckwheat swells still more than oats, by boiling, but fowls will consume fourteen pints boiled in the same space of time that four dry ones would be sufficient. Mowbray pronounces it an unsubstantial food. Maize (or corn) is said to be more profitable boiled than raw. When kept long upon it they begin to dislike it, and it is perhaps on this account that less of boiled maize is consumed. The saving is supposed to be one-third or one-fifth.

Fowls which would have eaten two pints of dry barley a day ate but three pint-measures of the boiled grain. Therefore, as ten pint-measures of boiled barley are produced from four pints of dry, three pints of the boiled are equivalent to no more than six-fifths of a pint of the dry, consequently the experience in dry barley is to that of boiled as ten-fifths to six-fifths, that is, as ten to six, or as five to three, showing a saving of two-fifths by giving boiled instead of dry barley.

We have found by experience that barley is more profitable and effective when boiled than when raw. If given warm, but not hot, we have known it to hasten, materially, the period of laying, and to promote, in a high degree, the health and comfort of the hens.

Wheat, as shown in the preceding table, increases in bulk by boiling, nearly the same as barley, and these interesting experiments prove that the use of boiled maize, barley or wheat is a matter of economy. The expense of fuel must be taken into account, but in the routine of almost any domestic establishment this must be comparatively trifling. It may not be unnecessary to repeat that there is no profit, but only the loss of fuel, time and trouble, in boiling oats, buckwheat and rye.

The Growth of Young Chicks.

The reader may no doubt consider that a large amount of *work* is being laid off to be performed, but we can only reply that if you suppose raising chicks for market requires no labor our advice is not to invest any money in them. It is *all* work and attention, both early and late, and the slightest neglect may change a prospective profit to a total loss. We are asked how much is required for feed, and how much will a chick weigh at a certain age. We can assure our readers that by systematic and judicious feeding we have had them to weigh two pounds when they were eight weeks old, and we have had the same breed of chicks to weigh only a pound and a quarter at the same age, both broods being attentively cared for,

and fed well. It was the *quality* of the food that made the difference, and not the *quantity*. A little extra meat and milk, with greater variety, gave a difference, and yet the smaller chicks always had as much as they could consume, but the food was inferior to that allowed the larger ones. Our *economy* resulted in a loss from the smaller chicks but a profit from the larger ones.

We cannot refrain from mentioning an experiment made for the purpose of carefully noting the growth of chicks to a certain age, and which was made known in the *Farm and Garden*, with which we have for years been connected. The chicks were carefully weighed at the end of each week, and the result was as follows:

The egg weighs	2	ounces.
Chick newly hatched weighs	1¼	"
" 1 week old "	2	"
" 2 weeks old "	4	"
" 3 " " "	6¼	"
" 4 " " "	10	"
" 5 " " "	14	"
" 6 " " "	18½	"
" 7 " " "	23½	"
" 8 " " "	28	"
" 9 " " "	32	"
" 10 " " "	36	"
" 11 " " "	41	"

The chicks experimented with were Plymouth Rocks, though considerably mixed with other bloods. They were fed mostly on a mixture of bran, oat meal and corn meal, moistened with milk or water, and baked, sometimes merely cooked with boiling water. Whole wheat and skim milk cheese served as a variety during the first four weeks, and the cake was sometimes made richer by the addition of a little animal meal (pulverized dried bone and meat). Out of quite a large flock, not one chicken died from disease. They were fed very regularly, three times a day, and all they would eat up clean. A flock which increased two pounds in weight a day consumed less than six pounds of corn meal, or its equivalent in other food, in twenty-four hours; and what vegetable or animal matter they could pick up, which, in spite of unlimited range, did not appear to be very much; at least, they were always hungry when they came to their meal. From the above, you will see that the actual expense of making one pound of "spring chicken" was in this case not more than four cents. The market price in cities during July varied between twenty and twenty-eight cents. We might have grown these chicks still faster by giving them a greater variety of food, but did not attempt to force them. Or we might have grown

them slower, but with less expense, had we made them shift for themselves. There were *no* grasshoppers.

Let us analyze the weights and notice the ratio of gain. The first week the chick did not quite double in weight, but the second week it doubled exactly. The third week, though not doubling in weight, the gain was greater than during the second week, and it is apparent that for some cause or other the ratio was not equal to that before and after the third week, the gain being only $2\frac{1}{4}$ ounces, while during the fourth week the increase was $3\frac{3}{4}$ ounces. The fifth week the gain was still greater, and the ratio is given below:

Chick newly hatched		$1\frac{1}{4}$	ounces.
" gained 1st week		$\frac{3}{4}$	"
" " 2d "		2	"
" " 3d "		$2\frac{1}{4}$	"
" " 4th "		$3\frac{3}{4}$	"
" " 5th "		4	"
" " 6th "		$4\frac{1}{2}$	"
" " 7th "		5	"
" " 8th "		$4\frac{1}{2}$	"
" " 9th "		5	"
" " 10th "		4	"
" " 11th "		5	"

The greatest gain, considering the age, was made when the chick had attained the age of seven weeks, the chick then weighing $23\frac{1}{2}$ ounces, or very close to $1\frac{1}{2}$ pounds. When nine weeks old the weight was exactly two pounds (32 oz.).

Although the weights here given refer to that of a single chick, the experiment was made with a small brood, and an average arrived at. The term "chick" is used here simply for convenience, and we call particular attention to the fact that the cost of making each *pound* of "chicken" was *four cents*, but it may be further stated, by way of repetition, that they were not forced, and could have been made to weigh a little more, or by attempting to make *three* cents grow a *pound* of "chicken" the growth would have been less. The *quality* of the food is the secret of growth, and we have always claimed and demonstrated that, from the time the chick is hatched until it is grown, the cost per pound of "chicken" at all ages is *five cents*, as a maximum limit, but if the five cents is not judiciously expended it will not produce half a pound.

The Profits From Chicks.

The profit depends upon the season of the year in which the chicks are hatched. About the 15th of January is the beginning of the broiler season, which ends about the first of June. The prices

are highest during March and April, and chicks that weigh half a pound retail from 75 cents to $1. Then the chicks that weigh three-quarters of a pound are preferred, which are followed by those weighing a pound. A good rule for prices is the following: *The sum of seventy-five cents is the price to be expected from half a pound to six months of age.* This uniform price runs in this manner: A half-pound chick sells at $1.50 per pound, or seventy-five cents per chick. A three-quarter pound chick sells at $1 per pound, or seventy-five cents. A pound chick sells at seventy-five cents. A one and one-half pound chick sells at fifty cents per pound, or seventy-five cents, and so increases in weight and decreases in price until the chick weighs six pounds, and sells at twelve and one-half cents a pound, or seventy-five cents. Of course, the prices sometimes vary, but we can safely assert that if half-pound broilers reach the market in March, and the chicks brought in continually until the season for "spring chicken" is over, there will be no difficulty about prices. The figures given are retail prices for one dozen chicks.

Observe that in the experiments given the chick weighed ten ounces when four weeks old. Let us leave off two ounces for a margin and consider eight ounces for four weeks of age. The cost will be just *two cents* for food. Now let us suppose that instead of selling the chick for seventy-five cents we leave a *great margin* in prices, and call it twenty-five cents. We will then have twenty-three cents clear profit from an expense of two cents for food. In the experiments, however, the chicks gained a quarter of a pound the next week, and, while weighing ten ounces at four weeks of age, reached fourteen ounces when five weeks old, having gained a *quarter of a pound* the fifth week, and as the ratio was more than a quarter of a pound each week thereafter (often reaching five ounces), we may safely claim that up to the age of three pounds a chick will gain, *at least*, one-quarter of a pound per week as follows:

Chick 4 weeks old	$\frac{1}{2}$	pound.
" 5 " "	$\frac{3}{4}$	"
" 6 " "	1	"
" 7 " "	$1\frac{1}{4}$	"
" 8 " "	$1\frac{1}{2}$	"
" 9 " "	$1\frac{3}{4}$	"
" 10 " "	2	"
" 11 " "	$2\frac{1}{4}$	"
" 12 " "	$2\frac{1}{2}$	"
" 13 " "	$2\frac{3}{4}$	"
" 14 " "	3	"

In the experiments the chick weighed two pounds at eight weeks of age, but we have allowed two extra weeks for a safe average for an entire brood, as some of the chicks may be sickly, or inferior,

but we could have easily put down that a chick will weigh three pounds when three months old (thirteen weeks), for we have had them to weigh four pounds at that age.

Another experiment demonstrated that chicks double their weight every ten days until they are forty days old, but such rule is not infallible, as we find the gain greater at some periods than at others, but the cost of food for the second experiment was one cent a week until the chicks were ten weeks old, when the expense increased, but so did the weights. It is admitted, however, that the chicks were not as well fed and provided for as they should have been. The cost was of course less than one cent until the fifth week which was exactly one cent, and when the tenth week was reached the total amount expended for each chick was exactly ten cents for ten weeks, the small amount eaten the first four weeks leaving a surplus which was added to the latter period of the experiment. The weight of a chick at the end of six weeks was exactly eighteen ounces, or a pound and two ounces, the cost being six cents. Let us now look at the table and notice how it compares with the others, we doubling the weight of the chicks every ten days.

Chick at hatching	$1\frac{1}{4}$	ounces.
" 10 days old	$2\frac{1}{2}$	"
" 20 " "	5	"
" 30 " "	10	"
" 40 " "	20	"

Now compare it with the first result, which we gave in weeks, and we find that in three weeks (twenty-one days) the chick weighed six and one-fourth ounces, while in the case just mentioned the chick, in twenty days, weighed five ounces. We are satisfied with the close result. In thirty days the chick doubled from five ounces to ten ounces. In the result by weeks we find that the chick four weeks old (twenty-eight days) weighed ten ounces, only two days difference in ages between them. In forty days the chick weighed twenty ounces, having doubled again in ten days. In the result by weeks we find the chick at seven weeks old (forty-two days) weighing twenty-three and one-half ounces, and as the two days difference is *something* it partially compensates for the heavier weight, but we have demonstrated, by two different experiments, that a chick will double in weight every ten days until it is forty days old, and that, though not doubling after that time, the ratio of increase is, however, very rapid.

It is conclusive, also, that a chick will gain *at least* one quarter of a pound every week, on an average, until it is three months old.

In one experiment we made the cost of food four cents a pound,

and in the other we made it more, but as the cost of food for the six weeks was six cents, and the chicks weighed about eighteen ounces (a pound and two ounces), the cost was a fraction over five cents a pound, but the ratio was reduced as the chicks advanced in age, as the gain in flesh was greater, and hence, in order to leave a fair margin, we can confidently state that the *maximum* cost of a *pound* of "chicken" from the shell to maturity, is *five cents*, but maturity means the moment a chick becomes a fowl, as it is easily made plain that a fowl, when once it has reached the limit of its weight, may become five years old, and yet not weigh an ounce more, but consume any amount of food. Thus, *young poultry* can be produced the *cheapest*.

Late Hatched Chicks.

It is often asserted that late hatched chicks are not profitable. Let us examine the matter. If we are willing to admit that "figures do not lie," we can easily solve the problem in a few moments. It must be granted that our estimate for food given here was made for *early chicks*, which were hatched in cold weather, at a time when green food is scarce, and prices higher for milk and other articles, and it is therefore plain that if the prices are low the cost per pound is also lower than when produced during winter, and is not equal to five cents a pound. But, however, we will allow five cents as the cost per pound, even in summer, and estimate upon that basis. Chicks *always* sell for a few cents per pound more than fowls, and we make an example by supposing a chick weighing two pounds sells for fifteen cents a pound, which is thirty cents. As the cost of production will be five cents a pound, or ten cents for two pounds, we have a *clear profit* of twenty cents, or two hundred per cent. But, says some one, perhaps, there is a certain time of the year when fowls and chicks do not realize more than ten cents a pound. We deny that chicks not over *three pounds* sell at such a low price in the large cities, but admit that they sometimes sell at that price when *over* three pounds in weight. But in order to be generous we will grant that two-pound chicks *may* at some particular time sell for ten cents a pound, which is twenty cents for the chick. As the cost is ten cents for the two pounds we have ten cents profit, which seems very small, but is, nevertheless, one hundred per cent profit on capital invested for food. Though ten cents profit on one chick is not a large sum, yet it amounts to many dollars where thousands of chicks are raised for market.

The Best Breed For Market Chicks.

A market chick should be plump in body, have yellow skin and legs, and, strange to say, attractive plumage, as the feathers sometimes deceive inexperienced buyers. And we will here remark that it is not easy to *fatten* a *growing* chick, but as broilers are sold alive the feathers, legs, head and bones all assist in making up the weight. In an experiment with breeds we found that up to the weight of one pound the chicks of *all the breeds* were very close together in the average, but after a pound weight was reached the larger breeds gradually gained upon the smaller kinds.

A crossed chick is usually hardier, and grows faster, than a pure-bred chick. The fastest growing chick is produced by crossing a Plymouth Rock cock on a hen that is half Houdan and half Brahma. The best chick for the table is produced by crossing a Pit Game cock on hens that are half Dorking and half Brahma, but they are not as hardy as the first mentioned cross. To procure a first-class market chick cross a Dorking cock on large Brahma or Cochin hens. Mate the produce of the cross with a large, vigorous Game cock. Then cross the Game-Dorking-Brahma hens with a Plymouth Rock cock, and the chicks will possess a combination of good qualities that cannot be surpassed.

But as many persons do not wish to extend their time of operations in order to produce the best hens let them grade up their common flocks with the use of Brahma cocks, in order to get large-bodied hens, and then use Plymouth Rock or Wyandotte cockerels. In the above crosses we have kept in view the yellow skin and legs, but if the color is no object we can safely recommend the Langshan as one of the best and hardiest breeds of chicks known. In fact, all the Asiatics are hardy, and although a well feathered chick may be attractive, yet a chick that feathers slowly is more easily raised than one that feathers rapidly, as the production of feathers is a great drain off the system, for the slower the progress of feathering the greater the weight attained, and hence our readers should keep these facts in remembrance at all times. A dash of Asiatic blood—Brahmas, Cochins or Langshans—should always be infused in the brood, and let us enjoin you never to use a scrub cock. The hens may be mongrels, if preferred, but the male should *always* be a *thoroughbred.*

Do not waste your time attempting to raise market chicks from such breeds as Black Spanish, Polish, Hamburgs, etc. The Leghorns may do well if crossed on large hens, but one-fourth Leghorn

blood is enough. Do not use the same cockerel more than one season, and always sacrifice "points" for vigor and activity. Should a certain cross prove unprofitable do not repeat it, but always have one yard for *experiments*, as there is no knowledge so beneficial and lasting as that gained from practical application of that which may be suggested, no matter from what source it may be derived.

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DISEASES OF YOUNG CHICKS.

The diseases peculiar to young chicks are different from those that affect adults. Hence, in treating of disease we confine ourselves to such as the young broilers are subject until they reach the market, deferring the matter of diseases of fowls for No. 4 of this series. One of the main obstacles the poultryman has to contend with is

Leg Weakness.

Leg weakness usually arises from two causes—rapid growth, and too much underheat. Should leg weakness appear it will generally be the result that the chicks have good appetites, are heavy in weight, and to all appearances apparently well, excepting that they are weak on their legs. The rapid growth, due to high feeding, causes an undue development of fat and tissue in comparison with bone formation and strength, the chick sometimes being nearly helpless, and often moving on its knees. The difficulty is not necessarily dangerous unless the chicks are crowded, as the active ones soon trample to death any one of their number that is unable to help itself. This is one of the evils of crowding chicks together, and causes greater loss than from any other direction, as every member of a brood gives his sole purpose to that of self-preservation, showing no mercy to another. Should a chick become sick, and fall in the brooder, every other chick seems disposed to walk upon him, and should a sick chick be so situated as to be in the line of pressure he is doomed. Like a panic-stricken crowd rushing from a building in danger the one who falls is sure to perish.

Bottom heat also causes leg weakness when the heat comes from the bottom *exclusively*. This is due to a slight attack of rheumatism, caused by chicks becoming accustomed to artificial heat on the legs and thighs to such a degree that they are easily affected in the

lower members when exposed, and is, therefore, increased by damp weather.

The best remedy for leg weakness is to remove the chicks so affected from those that are healthy. Give finely powdered bone meal in their soft food—a teaspoonful daily to one dozen chicks is sufficient—and give them tincture of iron in their drinking water, a teaspoonful of the tincture to one quart of drinking water being sufficient. Vary the food as much as possible, and see that they are provided with a warm, dry location.

Bowel Diseases.

Young chicks are subject to constipation and diarrhœa. The first may justly be called dysentery, and is due to colds and diet. For the first two weeks young chicks may seem apparently well, and then gradually drop away one by one until only the few stronger ones are left. Dysentery we may class as cold on the bowels, and results from the chicks becoming chilled at some time or other. If a young chick becomes chilled, and is then resuscitated immediately by warmth, it will apparently recover and be as well as ever, but, like a child that has caught cold, the *effects* will be seen in a day or two after. Any obstacle that causes a check to the chick exerts some injury, and the chick is liable to cold on the bowels, or even the croup. When the rear parts seem clogged up, and accumulations take place, the chick may be treated in the manner stated on a previous page, but heroic treatment sometimes becomes necessary when a whole brood is affected, as is often the case. Each chick must be handled, and carefully attended to. The parts must be washed with tepid water, thoroughly cleaned and wiped dry, and the chick must at no time be allowed to become chilled during the process. Then anoint with a mixture of castor oil and glycerine. Should the chicks be weak, give each one a teaspoonful of milk, with one drop of tincture of iron, three drops of paregoric, and as much quinine as can be held on a nickel five-cent piece for every ten chicks. This mixture is an excellent invigorating tonic, and will assist them very much. It should be done twice a day until they improve. Before giving the tonic, however, give a teaspoonful of castor oil for every four chicks.

Should diarrhœa appear, give castor oil as before, and a tonic composed of tincture of iron one part, brandy two parts, and paregoric two parts, two drops being sufficient for each chick twice a day. These tonics may be given in twice their bulk of water.

If any signs of bowel disease appear the first object to be

examined should be the drinking water. It should be always fresh and clean. Next, observe the food, and change it. Hard boiled eggs, when fed continuously, often cause constipation. By noticing the food it will be a guide to the treatment. If green food is not being fed allow finely chopped onion (tops and bulb) and if green food is being fed cease its use for a day or two. Always make a complete change. In diarrhœa a little boiled milk and rice, salted to taste, and a teaspoonful of ground ginger added for each gill of the mess, will be found excellent and nourishing. Cold oat meal porridge, seasoned with a small proportion of salt and red pepper, makes a good change from the rice, but whenever a new food is tried do not change it as long as it is proving beneficial.

One of the best tonics for young chicks is to use one gill of lime water, to which is added one spoonful each of quinine, brandy, tincture of iron, and tincture of ginger. Shake well before using, and give five drops to each chick twice a day. Always keep sick chicks warm, and do not allow the slightest dampness on the floors, or permit the chicks to go among the wet grass or in the dew. And if too much soft food is being fed, substitute grain in some dry form.

Feathering.

Some chicks shed out little feathers in a few days after being hatched, as the Leghorns, while others, such as the Brahmas and Cochins, remain nearly naked till well advanced. They sometimes show no signs of disease, but gradually begin to droop, cry continually, and finally die from some apparent unknown cause. Usually, the difficulty is due to a heavy drain on the system for the elements that compose the feathers, which may be lacking, the chick starving for proper nourishment though fed liberally. And not only should they receive the proper food but it should be given *often*. It is well known that many birds, the pea fowl for instance, feather so rapidly that the young ones fly and perch upon fences and even trees in a very short time after being hatched, and should a single meal be neglected in feeding them it sometimes proves fatal. Chicks, though feathering rapidly, do not make the progress in that respect as is done by young turkeys and pea fowls, but at the same time the change from down to feathers is rapid enough to demand constant feeding of the best quality of food. It is a knowledge of this fact that prompted us to suggest our various preparations, and it will no doubt be noticed that we recommended the phosphates, carbonaceous matter, and also nitrogenous food, as well as sulphur and iron. The chicks need a *variety* at such time and should be well supplied with all they require.

The chicks that do not feather rapidly, and remain naked until quite well advanced, if kept warm and dry will usually prove the hardiest of the brood, growing quickly, and when lifted with the hand will be above the average in *weight*. When matured such chicks are usually better feathered than those that feathered earlier. Not being compelled to supply the growth for feathers they grow fast in bone and flesh, are less liable to diseases, and reach a weight for market sooner than the others. Warmth is equal to good feeding, and economizes in expenses.

Gapes.

Cholera and roup seldom attack broilers, for, although roup is due to colds, and carries off the adults, the gapes and cold on the bowels are the diseases most prevalent among young chicks. When the chick seems to gasp frequently it is a sure indication of gapes. The gapes never occur among a brood when the feeding places are clean. It is a standing menace on old-established farms, where the yards are filthy and the food is eaten from the dirt. If the chicks are well kept no gapes will appear. Should the disease attack the brood, however, one of the best remedies is to feed cooked meal, in the shape of dough, and, while the dough is warm, mix intimately a teaspoonful of spirits of turpentine to each pint of food. Should the chicks refuse to eat, give each a pill of the dough, first adding to the pill one drop (or two) of the turpentine. Repeat the dose, if necessary, but once usually suffices. As an assistant to the turpentine the chicks, in an hour after receiving the turpentine, may be placed in a box (soap box will answer) and a mixture of one part turpentine, one part wood tar, and a few drops of coal tar, should be burned in the box, so as to surround the chicks with the dense fumes, compelling them to breathe the same until nearly suffocated. Should they be exhausted, a few drops of ale or vinegar will soon refresh them.

As to what constitutes the gapes may be explained by stating that as long ago as 1797, Dr. Wissenthal, of Baltimore, gave an excellent account of a parasite infecting the trachea of fowls and turkeys. He says: "I have seen the whole windpipe completely filled with these worms, and have been astonished at the bird's being capable of respiration under such circumstances." The worm, which is a nematoid parasite (*Sclerostomasyngamus—Syngamus trachealis* of some authors), has been found in the trachea of the turkey, common fowl, pheasant and partridge (European), and in various storks, crows, and in small birds of several species. The female worm measures five-eights of an inch in length, the male one-third of an

inch. The mouth is situated at the extremity of the body and is furnished with six prominent, horny lips. The body is smooth and ends in an abruptly pointed tail, which folds more or less upon itself in the case of the female worm. The male has a sucker-like *bursa* or pouch at the lower extremity of his body. The ova are large for so small a worm, being fully 1-250 of an inch in length; active embryos may at times be seen in them. The two sexes are frequently found firmly united together, and it is probable that the eggs can only be liberated by the death and decomposition of their parent. If the infested fowl does not succumb to their ravages, they are probably, after a certain time, expelled, and dying on the ground the ova and embryos are liberated by the decomposition of the maternal body.

The larval parasites then burrow into the soil or into decaying vegetable matter, and there pass through certain metamorphoses, at the completion of which, though still in a larval condition, they are ready to be returned to the proper habitat of the adult worm, viz., the trachea of certain birds. Introduced into the mouth with food or drinking water, they make their way to the air passages, and there commence their ravages, and reproduce their species, to again pass through the same cycle of changes.

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ITEMS OF INTEREST.

For the first twenty-four hours warmth is more essential than food, for should the chick become chilled in the slightest degree it may prove fatal. Hence, in removing them from the incubator to the brooder do so as quickly as possible.

Chicks will recognize any signal as quick as they do the "cluck" of the hen. Whenever you approach them tap on the brooder with your finger, and you can call every one to your hand. Should you wish to disperse them cough harshly and they will scatter in every direction. Should you stand by the brooder very attentively for a few days you will find that whenever you are absent they will cry continually until you return, when the noise will cease, to be repeated whenever you leave again.

Be kind and gentle to the chicks from the time they are out of the shell till sent to market, and they will become very manageable, which saves much labor and time.

LITTLE chicks, like all young stock, are fond of enjoyment. They will thrive much better when they have an opportunity for exercise. Not that it is necessary to allow them to run outside in yards, but that conveniences should be provided for them in the brooder houses. A little pen, one inch high, into which sawdust, chaff, or finely cut straw is placed, will afford an excellent place for them. Scatter screenings, coarse oat meal, sand, ground bone, fine charcoal and ground oyster shells in the material for them to scratch out, and a few quarts of dry earth will also be of assistance, as they will work industriously if given an opportunity.

As long as a young chick is scratching in litter it is an infallible indication that the chick is in perfect health.

A GREAT many diseases of chicks may be cured by what is called family treatment. A few grains of powdered chalk and two drops of paregoric will often cure diarrhœa, and the same treatment given them as is given children will be found very beneficial. Laudanum is too strong to be used for chicks, but tincture of camphor is excellent. For a young chick two drops in double its quantity of water, twice a day, of such medicines, is sufficient.

ALWAYS salt the food to suit the taste, as salt is beneficial to poultry as well as other stock. Bi-carbonate of soda (bread soda) is excellent, a grain once a day, in a small quantity of water, being an excellent remedy for diarrhœa when caused by an excess of green food.

FENUGREEK, which is the active ingredient of cattle and horse condition powders, is excellent for fowls. Used in the proportion of a teaspoonful daily for every twenty chicks, given in their soft food, it will tend to cure debilitated chicks, and increase the appetite. As a tonic, one part fenugreek, one part carbonate of iron, one part ground ginger, one part pulverized charcoal, and one part ground chalk, mixed together, is one of the best known. Give a teaspoonful, twice a day, to every twenty chicks, in the soft food.

TOO MUCH soft food, unless fed *very cleanly*, will cause the gapes, especially if any portion is left over. Hence, after feeding, allow not the slightest trace of the food to remain.

LICE and gapes usually appear together, as a rule, owing to the fact that both are caused by the same circumstances—*filth*.

AVOID greasing chicks, as it often proves fatal. A small quantity of lard, to which coal oil is added, in proportion of four drops of coal oil to a teaspoonful of lard, may be used for anointing chicks when lice affect them. The slightest quantity only should be

used, by placing a little on the top of the head and at the vent. If preferred a drop or two of carbolic acid may be substituted for the coal oil.

WHENEVER young chicks begin to droop without apparent cause, refuse to eat, and loss begins to occur, *look for lice*. The lice will hide, and sometimes cannot be found easily, but a close search will show their presence, if any. You must now be as prompt with the vermin as though you had found the house and human individuals afflicted. Every part of the brooder must be well and *thoroughly cleaned*. Each chick must be held by one leg, head downward, and dusted with pyrethrum (Persian insect powder) and the brooder washed with a solution of one part carbolic acid and ten parts water. Allow the brooder to dry before returning the chicks, and repeat the dusting of the chicks several times, dusting also a little of the powder on the floor and in the crevices. If the chicks are weak give each five drops of ale, with one drop of tincture of iron mixed with the ale, and induce them to eat by placing rice and milk before them. In this connection we will state that a mixture of one-half rice water (thin) and one-half milk (fresh), to which a pinch of salt and bread soda is added, will always be found an invigorating drink for young chicks.

WHENEVER young chicks refuse to eat, and medicine is necessary, open their beaks and compel them to swallow it, but let the doses given be small, repeating until a sufficiency has been partaken by the chick.

SHOULD a chick seem weak remove it at once from the brooder, as it will certainly be crushed to death at night by those that are stronger.

DAMP weather often causes the chicks to droop and appear unwell. On such occasions be sure to keep the brood warm and comfortable.

DO NOT be tempted to let the heat become very low, because the weather may become fair and warm. Even during the warmest days of July a young chick will desire to warm himself in the brooder. Remember, that should you allow the brooder to become too cold, and the chicks show their want of heat by nestling close together, you will probably find some of them dead. It is an indication that something is wrong whenever the chicks persist in getting close to the source of heat. The heat should always be evenly distributed.

A CHICK that will not eat, and does nothing but cry, stands but a poor chance of living.

A GOOD poultryman always takes a look at the chicks as the last important matter before going to bed.

A GOOD, safe, non-explosive, anti-smoking lamp is ten times as cheap as one that cannot be depended upon, hence we recommend the lamp manufactured by Chas. V. Gross, Box 67, Pullman, Ill., as it has a cooling and pressure arrangement surrounding the oil.

A GREATER proportion of chicks can be raised in brooders than with the use of hens if properly managed.

SOME diseases are caused by a lack of certain foods, hence bone meal will sometimes cure diarrhœa.

SHOULD you be unable to purchase bone meal procure from a drug store phosphate of soda, and use a teaspoonful once a day for twenty chicks. If lime or oyster shells are unobtainable use chalk instead.

A SPOONFUL of chloride of lime, dissolved in a quart of cold water, is excellent for washing parts of the brooder that may have become filthy, and it makes an excellent disinfectant, as well as preventing lice.

IN using grains, popcorn, broom corn, sorghum, millet and rape seeds are excellent. When the chicks are large enough use wheat also. Screenings are best for very young chicks, and cracked corn may be given twice a week.

As many people living away from bone factories may have difficulty procuring some of the articles recommended here, the following is a perfect *food, tonic,* and invigorating *condition powder.* Powdered chalk, phosphate of soda, fenugreek, chloride of iron, flax seed (ground), charcoal, and cotton seed meal, of each one pound; red pepper, ginger, salt, bread soda, Peruvian bark and sulphur, of each, one ounce. Mix *thoroughly,* all the ingredients being made fine for that purpose, and give a teaspoonful once a day, in the food to twenty chicks.

A WEAK chick, if taken from the incubator and immersed in water at a temperature of 110, thoroughly washed, and kept nicely warmed until very dry, will be greatly benefitted. Such warm water baths are excellent at times for sickly, debilitated chicks.

SOUR milk, buttermilk or curds will be highly relished by chicks, and do no injury, but it is best not to give such until after the chicks are two weeks old.

PARCHED grains of any kind, such as oats, wheat, buckwheat, or even cracked corn, is an acceptable and excellent change if allowed occasionally.

THERE are a great many substitutes for meat. Milk is one, so is bullock's blood, and the refuse parts of carcasses. It should always be cooked. When cooking grain food, blood may be added, or the blood may be placed in a flannel bag and boiled. The lights, liver and other cheap parts of an animal may be boiled to a rich soup, thickened and fed.

CHICKS can endure quite a low degree of cold, but must be so situated as to be able to quickly warm when they desire to do so. They seldom suffer from cold on the feet and legs, but chill easily when their bodies are exposed.

NO ONE can expect to be successful who does not use proper precautions against cats, rats, hawks, and minks. In constructing houses, coops, or yards, always endeavor to have them proof against such vermin.

THE cat that allows the chicks to roost on her back and share her food during the day knows enough to eat them slyly when the owner is not near. The *best* cat that ever lived will kill and eat chicks, although she apparently takes no notice of them.

COMMON glass chimneys should not be used for lamps in brooders, as they often become too hot, smoke, and sometimes cause explosion.

YOUNG turkeys are fed somewhat similar to chicks, but should have a greater proportion of green food, and should be kept free from dampness. The turkeys also need more exercise.

ALL things considered, good milk is the cheapest kind of food we have; for 3 pints of it, weighing $3\frac{3}{4}$ pounds, and costing nine cents, contain as much nutriment as one pound of beef which costs eighteen cents; 3-7 pounds of milk is equivalent to 1 pound of beef in flesh-forming or nitrogenous constituents, and 3-17 pounds of milk is the equivalent of 1 pound of beef in heat-producing elements or carbohydrates. Therefore, the relative values of milk and beef as human food are as $3\frac{1}{2}$ to $11\frac{1}{2}$, or in round numbers, as 1 to $3\frac{1}{2}$. If milk is eight cents per quart, then it is the equal in food value to beef at twelve and one-half cents a pound, and *vice versa;* when beef is at twenty-five cents per pound, then milk should be nineteen cents per quart, calculated on its food value. We thus see that, at any ruling prices, milk is one of the cheapest, if not the cheapest, food that can be furnished to the family, while all experience is in favor of its healthy qualities. There is no loss in cooking the milk as there is in cooking beef, and there is no bone in it that cannot be eaten; it is simply palatable, nutritious, healthful, cheap, and always ready for use, with or without preparation.

YOUNG ducks and geese are very voracious, and will eat anything that is suitable.

GINGER is much better than red pepper for young chicks, and they are very partial to it.

PERUVIAN bark, given two or three times a week, in the proportion of a teaspoonful to twenty chicks, is one of the best tonics that can be given. It will be found more advantageous, however, to mix Peruvian bark with the same quantity of ginger, giving a teaspoonful of the mixture to twenty chicks.

WHERE many thousands of fowls are raised a sheep may be slaughtered for them. In France the old horses, which can be bought at a low price, are used, as also dogs, cats, rats, or any other animal, but the meat is always well cooked.

CRUDE tallow, which is cheap, may be profitably used as a variety, once in awhile.

A PARTIALLY drowned chick, though apparently dead, may be easily restored by being wrapped in flannel and placed in a very warm location. The same may be said of chicks that are cold and stiff from the effects of low temperature.

IF a brooder is kept warm, and the heat enters from the top, no flannel or sheep skin will be necessary, but little woolen strips may be suspended around the edges of the brooder in order to allow the chicks to pass in and out.

IF the chicks have the privilege of a small yard let the yard be spaded often in order to prevent gapes.

AN occasional fumigation of the coop with a mixture of wood, tar and sulphur, will be an excellent method of disinfection. The same may be said of a mixture of gas-tar, and sulphur.

REMEDIES FREQUENTLY RECOMMENDED.

For Leg Weakness.

This is due to forced growth and high feeding, the chicks seeming apparently well, with good appetites, but unable to stand up. Wright says it is also a frequent affection in cockerels of the large breeds. It may arise from muscular weakness, or from a deficiency of bony matter, the symptoms usually manifesting themselves between the ages of three and six months, though often much earlier. The free use of bone meal is the best preventive. The following prescription has been used with marked success:

Sulphate of iron (copperas)	16 grains.
Strychnine	1 grain.
Phosphate of lime	80 grains.
Sulphate of quinine	8 grains.

To be made into sixteen pills and one pill administered three times daily, morning, noon and night, for at least one week.

Another good remedy is made as follows:

Phosphate of soda	20 grains.
Sulphate of quinine	2 grains.
Tincture of iron	10 drops.
Powdered chalk	20 grains.

Mix with half an ounce of water, slake well before using, and give five drops to each chick, in the soft food, twice a day.

For Gapes.

Compel the chicks to breathe the fumes of a mixture of equal parts of wood tar and spirits turpentine, and give a drop of turpentine mixed with as much corn meal as will absorb it, twice a day. Wright, in speaking of gapes, says that when the disease has actually entered a yard there are various remedies more or less effectual. To add camphor, or even lime, to the drinking-water, has some effect, and may be enough in mild cases, or with a few chickens. The old-fashioned plan is to strip a small quill-feather, all but a small tuft at the point, and (moistening it in the turpentine or not) to introduce it into the trachea, turn it round, and withdraw it with the worms. This is effectual, but requires much care to prevent lacerating the windpipe, or causing suffocation. In this way thirty worms

have been successfully extracted from one chicken. Another method of individual treatment is to get some carbolic acid (which must be of the clear or white quality), and placing some in an iron spoon or saucer, hold it over a candle or lamp. Dense white fumes will arise, in which the chicken's head is to be immersed till nearly suffocated; or, if a number have to be treated, the whole may be confined in a box and fumigated at once, being, however, carefully watched through a hole in the box covered by a piece of glass. For, while this treatment is absolutely unfailing, it is rather a ticklish operation, since the worms have to be killed without *quite* killing the chickens, which is very easily done beside. There are other methods of cure more generally applicable, as in an outbreak amongst pheasants, which could never be treated in the above manner. MM. Montagu and Megnin have proved repeatedly that to substitute an infusion of garlic for water, and add fine-chopped garlic in the food, will check the complaint and kill the worms. M. Megnin has also tried, with marked success, dissolving in the water (to kill all worms which may find their way there) one part in one hundred of salicylate of soda, and dosing each pheasant with seven and one half grains of yellow gentian and seven and one-half grains of assafœtida—large fowls will need more. Only vermifuges which—like these—have a *strong odor* can be expected to kill parasites which inhabit the air-passages rather than the digestive canal; but there is good evidence of the success of this treatment in pheasant preserves which had been all but exterminated by gapes. It is a curious coincidence, and confirms the soundness of it, that an English "patent" taken out by Mr. J. H. Clark, a gamekeeper, is very similar. He takes, and intimately compounds,

Powdered quicklime	1 pound.
Powdered sulphur	½ pound.
Tincture of assafœtida	1 ounce.
Arsenious acid (white arsenic)	1 drachm.
Oil of thyme, or oil of cummin	1 ounce.

This is to be kept in a closely stoppered bottle, to prevent slaking of the lime or evaporation of the volatile constituents. When required, two or three tablespoonfuls are placed in a depression in the center of the coop, and then a sharp blast from the nose of a bellows blows it all up into the air, filling the coop and entering the nostrils of the birds. It is said that one application generally cures, but that if not, two, or at the most three, at intervals of twenty-four hours, will surely do so. The gapes may be known by noticing that the chicks will constantly gap, cough and sneeze, besides appearing dull and refusing to eat.

Bowel Diseases.

Should general constipation be cured by the remedies suggested, and the foods appear to cause indigestion afterward, one of the safest and best remedies for restoring the appetite is the following:

Calomel.....10 grains.
Powdered rhubarb.....12 grains.
Bi-carbonate of soda..... 6 grains.
Burnt flour.....20 grains.

Mix the above thoroughly, and divide into fifty pills or powders, using castor oil in sufficient quantity to moisten the mass. Give the chick a pill or powder three times a day for three days, and in nine cases out of ten it will restore the chick to health. It is also excellent for diarrhœa or dysentery, and as the calomel given is in very small quantity no danger need be feared from that source.

Should the chick be in pain from griping and straining at the bowels, give the above pills or powders every two hours for twelve hours, and then give ten drops of castor oil and four drops of paregoric mixed.

When the chicks, from some unknown cause, become weak and refuse food, appearing sluggish and inactive, give each a powder or pill composed of one-half grain of calomel and one-half grain of rhubarb, three times a day. The next morning give two drops of paregoric and one drop of tincture of iron mixed. Change the food entirely, the best for them being boiled rice and milk, with a pinch of fine charcoal in that required for each meal.

Stimulants.

When a chick is exhausted and an active stimulant is required, a drop of tincture of camphor and two drops of whisky or brandy, in a small quantity of water, will be found beneficial.

To give them a stimulant in their food make a compound as follows:

Ginger.....1 ounce.
Red pepper.....1 drachm.
Gentian.....1 ounce

A teaspoonful to twenty chicks is sufficient, twice a day. It is also an excellent invigorator for adults.

The Runs.

When the chicks are hatched very early it is best to place the hen and her brood in a covered run, into which the sun and light may enter. Glass is too expensive, but a box similar to a hot-bed may be provided so as to shed the rain. The covering for the run may be made by using simply cotton sheeting, and to render the cloth

air tight and warmer use the following preparation: 1 quart raw linseed oil, 1 oz. pulverized sugar of lead, and 2 oz. pulverized rosin. Heat in an iron kettle till all is dissolved, and apply with a brush, while hot, to the muslin while stretched over a frame. Endeavor to apply when two successive clear days can be had to dry it well before placing it over the vapor and heat of a run. Ready for use, these cost in money $1.25. and in labor enough to make the entire cost nearly equal the *interest* on glass for one year. In careful hands they will serve three seasons. They do not gather heat so rapidly during the day as glass, and hence there is less danger of burning or giving off heat; nor do they throw heat so fast at night, and so need less covering. Fitting tight to the frames they admit of no drafts, undergo no sudden changes, and suffer little from dampening off. Gardeners use them for hot-beds, and though some are prejudiced against them at first after once trying them they annually increase their number, finding them a cheap way of increasing their beds,causing no breakage like glass in careless hands, and are stored at less expense, and answer many other uses during the year.

Another method of rendering such coverings waterproof is to make a quantity of wheat or rye flour paste, and with this give the canvas, after it is laid upon the roof or panel, a good and even coat. The paste should be about as thick as that used for paper-hanging. This will leave the canvas as tight as a drumhead, and at the same time fill the surface sufficiently to prevent so great absorption of the oil. Glue size has the same effect, and is easily applied. It is said that panels painted in this way are very durable, and that the paint never cracks or scales off. White lead in oil colored with ochre is probably one of the best paints which can be applied upon the roof. Possibly, for the sake of its fire-proof qualities, a final coat or two of mineral paint might be of advantage.

No one who has once used a covered run for fowls will do without one in the future. Especially is this the case in raising young chickens. After one has once tried raising them beneath cover he will not know how he ever did it without one. The simple fact that it not only furnishes a protection from storms, but also an immunity from hawks and vermin, is sufficient argument in their favor; yet we think the greatest reason why every poultryman should provide one for his young fowls is because gapes do not then trouble them, and they have not to track through the cold, wet dew, after a hungry mother, and perish from the effects. Although this is one of the best things in a poultry yard, unless strict cleanliness is observed it will be the ruin of any flock of birds.

YOUNG TURKEYS.

The turkey usually lays about twenty eggs, and then begins to sit, but by taking the eggs away from her as they are laid she will lay as many as forty. It is best to allow the turkey hen to do the incubation, but some prefer to set the eggs first under hens, giving the turkeys about fifteen of their own eggs to sit upon. It is an unwise as well as a cruel plan, to set all the turkey's eggs under hens, and make her lay all the season. Late hatched turkeys never thrive as the early birds do, and they never grow to a size to realize a profitable price. The turkey's services are lost to her own offspring, for turkeys rear their own young much better than hens do; and it almost invariably happens that a turkey becomes so debilitated by laying all the spring that she wastes away and dies in moulting. The time when turkeys require the greatest care is until they are six weeks old, when the young cocks begin to show a little red on their heads. Dryness is of the first importance; large, roomy coops, with covered runs, are desirable, that the young birds be not allowed to roam in wet weather or when the dew is on the grass.

The food for newly hatched birds should be principally hard boiled eggs, with dandelion, lettuce or onions, chopped up with a little bread crumbs; to this may be added a little rice boiled in skim milk (if quite sweet), a little suet, and, if wet or cold weather, a little cayenne pepper, with grain of all sorts as the birds grow older. A fresh site for the coop every morning is indispensable, and a little exercise if the mother is a turkey—but not if she is a fussy old hen—is also advantageous as the chicks get on. A good sign is to see the young turkeys catching flies. In order to get fresh, untainted ground, it is a good plan to hurdle off part of the field—a new lea, if hardy—for the coops, and the grass should be kept mown closely to the ground. Turkeys will take to any young turkeys, whether hatched by themselves or not; so, when the young birds get fairly strong, transfer those hatched under hens to the turkeys. One has to be careful that the chicks do not perch on the rails of the hurdles or the tops of the coops; crooked breasts would be the inevitable result. They should be induced to sit on the ground as long as possible, and then taught to perch on low bushes and trees, and until they are shut up for fattening they are better never to have entered the fowl house. Having reached the age of two or three months, June has arrived and the birds are perfectly hardy, requir-

ing little care, but generous feeding. A more economical food is now desirable, and barley meal, with perhaps a little scrapcake, corn, barley, and small wheat, is the usual food.

Turkeys for Christmas should be shut up in a light, dry, roomy house the first week in November; troughs with as much corn and good barley as they can eat should be always by them, with two good meals a day of just as much barley meal, mixed with flat milk, as they can eat, and milk to drink. Sliced mangel, turnips, swedes and cabbage are useful and necessary, and plenty of sand, lime, ashes and brick dust should be in the corners of their house. Let the troughs be well cleaned every morning, and all surplus food removed; on a farm there are plenty of other fowls glad to clean up after turkeys. Charcoal should also be provided. Never mate birds that are akin with one another. Every year purchase a new bird for stock, unless the old bird is retained and hens of his breeding are not used. There is no economy in buying a cheap bird; a little extra expense about the gobbler will probably give three or four pounds weight in each young bird next year.

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YOUNG DUCKS.

We are aware that many of our readers are desirous of knowing something of the management of young ducks, and we therefore acknowledge our indebtedness to English breeders for many valuable suggestions. Ducks are aquatic birds, which, like geese, belong to the class of Palmipeds, and to the family of the Lamellated; that is to say, they are web-footed, and their bill is provided with laminæ, which act as teeth, on both mandibles. They resemble geese very much as to exterior shape and habits, so much so that it is difficult to say where the family of ducks ends and that of geese begins. We have already noticed the most important differences existing in the shape of the bill, length of neck, position of the feet, which are shorter and placed further behind than in the goose. Ducks are greater dwellers on the water than geese; in fact, one rarely sees them on dry land, unless on the grassy banks round ornamental waters or in a farmyard, but in the wild state they seldom leave the water. The tame duck is a polygamous animal, intelligent, cunning, quiet, with few complaints made of it in the poultry yard. This family of the Palmipeds is distinguished for the beauty of its plumage, and we know that Mandarin and Carolina ducks, which ornament our waters, are the handsomest in existence. Ducks moult twice a year. The down of certain species has a nota-

ble value; the down from the Eider duck forms a valuable staple of trade called "Eiderdown," which is found in the nests of these birds, where the females deposit it to sustain heat to the eggs during their absence to seek for food. The laying powers of ducks vary much according to species; the young are very hardy, and run to the water immediately after their birth, but they cannot fly till they are three months old. At that age they are called "Flappers" in this country in France "Halbrans," and in Germany "Halberentes," from "Halber" (half), "Ente" (duck).

There are numerous species of ducks, and any observer or student of natural history may judge of the different varieties at any of the ornamental waters in London or in the country, but many of these emigrate at certain times, and are known to return to their quiet home. To prevent their leaving the ornamental waters they mostly undergo the process of being pinioned, and there they increase and multiply.

Our object is to notice only those breeds which are reared for the market, and which must interest every farmer's wife who prides herself in her poultry yard. No doubt all our farmyard ducks come from the common stock, the "wild duck," and they differ from the latter by being larger, with coarse legs and feet, and which are often black, whereas the wild duck has legs and feet of an orange yellow. This is the common duck, and its plumage has all the variety of color imaginable; it weighs in the adult state about two and a half pounds.

The Rouen duck is very much larger and easier to rear; it requires very little water, whereas the common duck must have always at hand a stream or a pond. The Rouen is very precocious and very fertile, and can produce four or five score of eggs, whilst the common duck never lays more than half that quantity. The plumage is like that of the common duck, very variable but very pretty. It fattens easily and may be produced to weigh eight or nine pounds each. There is also a white variety of Rouen, a very pretty bird, but smaller, does not fatten so easily but is considered more delicate.

The Aylesbury duck, all white, with bill and feet of a pink color, quite as large and in some cases larger than the Rouen, a most excellent table bird, in fact superior to all others. The feathers of the Aylesbury being all white are more valuable than those of other breeds. The weight of a good Aylesbury ought to be about eight to nine pounds.

The Muscovy, or musk duck, appears to be a distinct breed; it is also called "Barbary duck," as it is supposed to be a native of the

northern coast of Africa; some say it originates from South America, particularly the Brazils and the Guayanas. The drake, a large bird, has a fine black plumage, with reflections of green and red crossed by a large streak of white across the wings, with red bill, the base of which is greatly carunculated. He is a very quarrelsome bird and not fit to be in a poultry yard. Being of a large size, he is usually made use of for crossing with common ducks. The result being mules they are usually unfertile, but make very good table birds, and lay well, and, for the reason of their being unfertile, the eggs may be kept much longer than others, they having no germ in them. The flesh of the Muscovy is very good eating, but as soon as the bird is killed the head must be taken off; otherwise it gives to the body a musky taste.

Of all the inhabitants of the poultry yard the duck is the easiest to rear. The eggs are generally given to a hen to sit on, in preference to a duck; it saves trouble, and they are hatched out with all the care and solicitude as if they were chicks, the poor ignorant mother not knowing the difference. Twenty-eight to thirty days are required to hatch out ducks. As they come forth take them from the hen so that her attention may be given to those not yet hatched. When the whole brood have made their appearance, take up the hen carefully and put her into a nice roomy coop on a grass plat, then allow the young ones to go to her; put a saucer with water and bread crumbs for the young ducks, and give the hen also some tempting food, for generally during the last two days of incubation she refuses to leave her eggs to feed. After a day or two give them barley meal mixed with water, or any refuse from the table, with boiled vermicelli; in a week they will be running all over the lawn catching flies and insects, and returning to the hen should the weather be cold.

In three weeks, should the weather be favorable, they will huddle together on the lawn or on a bed in the garden, heedless of the cries and anxious callings of the mother, and in a week after that the hens may be set at liberty, as the ducklings can do very well without her. At this period feed them with meal of any kind, or middlings mixed with onions or lettuce chopped very fine. Ducklings do not eat so much at a time as chickens, but their digestion is extraordinarily rapid; therefore their meal must be often repeated. Scraps of meat and fat are most excellent; they thrive well upon the refuse of the kitchen. Give them the run of the garden; they soon hunt out snails, slugs and insects. At from six to eight weeks of age young ducks are fit to kill—that is, when they get cross-winged. Up to this time

there is no necessity of sending them to the water, but flat vessels containing water must be always within their reach, for ducks cannot feed without that element. In that state they fatten much quicker than when allowed to swim. If, after that period, a selection has been made to keep certain of them as stock birds, then they must be allowed a stream of water or a pond; otherwise some breeds would perish, and most of the others would lay unfertile eggs.

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THE HEN ON THE NEST.

Do not give her too many eggs to cover. Many persons are disposed to be somewhat inclined to the opinion that a hen should have as many eggs as possible, allowing her, as a rule, thirteen eggs, and often more. If we will notice a hen when she is doing service at incubation it may be seen that she turns the eggs at least once a day, or rather whenever she comes off for food and water. She goes to the nest, and with her bill pushes to the center of the nest those eggs that are on the outer edges of the nest. She piles them upon the center ones, and then goes on the nest, and with her body works the eggs down, displacing those that were in the center, forcing them to the outer part of the nest. The eggs are therefore changed in position daily, and when the nest is very full some of the eggs will not be completely covered, the ends of the eggs often being discernible protruding beyond the feathers. This difficulty would not be so great if it affected those on the outside only, but as *all* of the eggs are treated to the same process they are subject to fluctuations of temperature alike. If the number of eggs in the nest does not exceed ten she will more easily cover them, and consequently hatch a greater proportion of chicks, especially in winter. She furnishes heat from her body, which is lower in temperature near the close of the period of incubation than when she begins to sit. As the chicks in the eggs also create heat, the equilibrium of temperature is maintained from the fact that as the heat from the hen decreases that from the chicks increases. The hen also provides moisture, which is given off from her body. This is imperceptible, but is true, however. In winter the hen should be given a warm nest, with few eggs, and food and water convenient, as well as a dust bath. She seldom comes off to feed but once a day, and she is more solicitous in regard to the dust bath than the food. In summer the nest should be on the ground, in a cool, shady place, and she may then be allowed thirteen eggs. It must be considered, however, that a small hen cannot cover as many eggs as a large one, and in

order to avoid having the eggs broken by a hen the nests should be so arranged as to allow her to walk *into* the nest, and not be compelled to *jump up* to the top of the nest and then *down* upon the eggs. As the eggs are not all in the center of the nest, due to the daily turning of them by the hen, they consequently vary in temperature, and this fact teaches us that no definite temperature can be decided upon as the correct heat for incubation, either with hens or incubators.

The moisture required for eggs at a high temperture is greater than that necessary for them at a lower temperature, which we will explain by stating that the atmosphere always absorbs a certain amount of water vapor. We cannot see the process of absorption but it is constantly occurring. The relative humidity of an atmosphere, when fully saturated with water vapor, is 100, and it then falls in the shape of rain. This limit of 100, however, does not imply that the atmosphere in winter contains as much vapor as it does in summer. It simply designates that as soon as 100 is reached the moisture is given off again, and falls to the earth, but *the warmer the air the greater the amount of vapor* necessary to saturate it. It rains in winter when the relative humidity is 100, and yet that amount of water vapor may not be sufficient to saturate a summer atmosphere to sixty, but until the atmosphere is saturated, or reaches a humidity of 100, it will absorb moisture from whatever source it can be obtained.

In operating incubators this fact has given rise to many suppositions. We notice that some persons are successful with incubators when operating them at a certain temperature, while others secure equally as good results from incubators at a different temperature, and at other times complete failure results. The solution of the difficulties may be traced to a lack of knowledge of the proper application of moisture. We have known chicks to come out of the shells when the temperature was only 98 degrees, and have known failures to occur when it was 102. The reason why success occurred at the lower temperature was because less moisture was required to saturate the air at that degree, while at 102 there was a small deficiency of moisture, a larger quantity being required to saturate it. A good indicator of the moisture is a wet sponge, placed in the egg drawer, among the eggs. As long as it does not dry there is a sufficiency of moisture; and even if the heat rises to 106, *if the moisture is plentiful*, the chicks sometimes come out strong. If the sponge becomes dry, however, it indicates that there is a lack of moisture. We do not supply moisture to eggs because they need it, for nature makes ample provision in that respect. We

supply it because we wish to prevent the atmosphere from absorbing it from the eggs. As soon as the atmosphere becomes heated it takes up more vapor than it previously required. This vapor must come from *somewhere*, and if it is not provided the eggs become dry, the chicks die in the shell, and especially after they have "pipped" through, as the opening made by the chick allows of rapid evaporation.

To explain how the hen gives off moisture we will give an example. Let the reader sit down in a chair by a stove in winter, close the doors, and keep the room very warm. In the course of about half an hour he will want a drink of water. He has not perspired, or apparently given off moisture, but nevertheless the dry atmosphere of the room has imperceptibly taken, through the pores of the skin, from the body, moisture which was insensible to the reader at the time, the system has become drier, and he feels thirsty. So with the hen. She does not sweat profusely, but there is exhaled from her body an insensible moisture which is just sufficient to saturate the air confined in her feathers, and which prevents the chick from being deprived of that which it requires. In other words the atmosphere never becomes too dry, and we are therefore led to believe that the majority of failures arise from insufficient moisture.

We may conclude, therefore, that heat, air and moisture are the essentials to incubation, the same being required for plant growth also. As the temperature for plant growth varies, the same may be said of the chick. The temperature may be low at one time and higher at another, but during the three weeks of incubation the *average temperature* must be sufficient to fully develop the chick. Extremes will destroy plant life, but the temperature may at times be so low as to be only above freezing, yet the plant will live. The next day a genial heat from the sun will refresh it, and it starts forward again, but if within a certain period of its growth it does not secure, *in the aggregate*, enough heat, it gradually withers and dies. In the early spring, when the temperature is low, the plant does not require much moisture, but when the warm days arrive, and it secures a large amount of heat, provided it is blessed with abundant showers, thereby securing a *sufficiency of moisture*, it grows rapidly. May we not claim that a similar state of affairs exists with the chick? We think so, and can verify our theory with the statement that we have demonstrated it to our satisfaction in our experiments with incubators.

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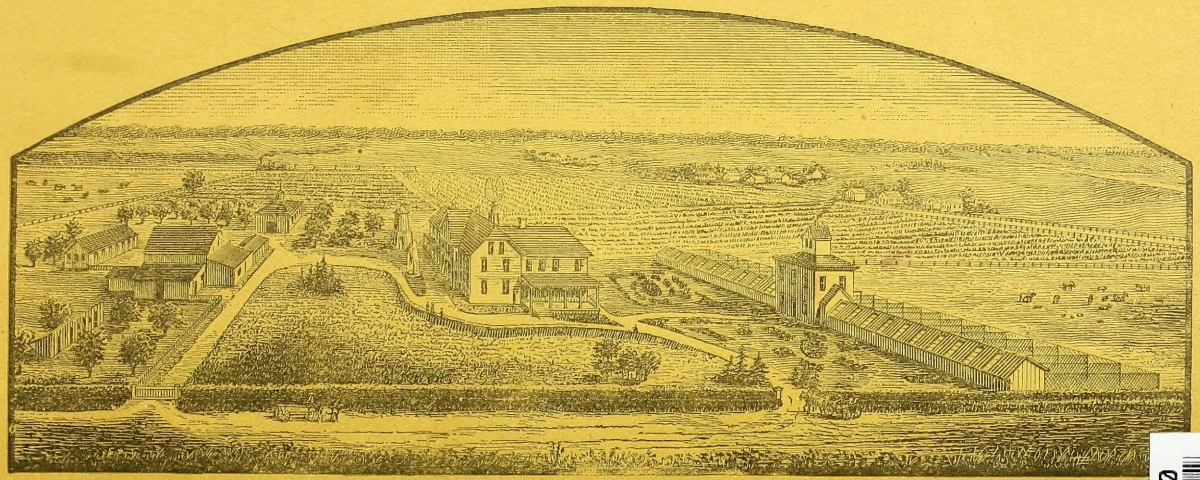

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