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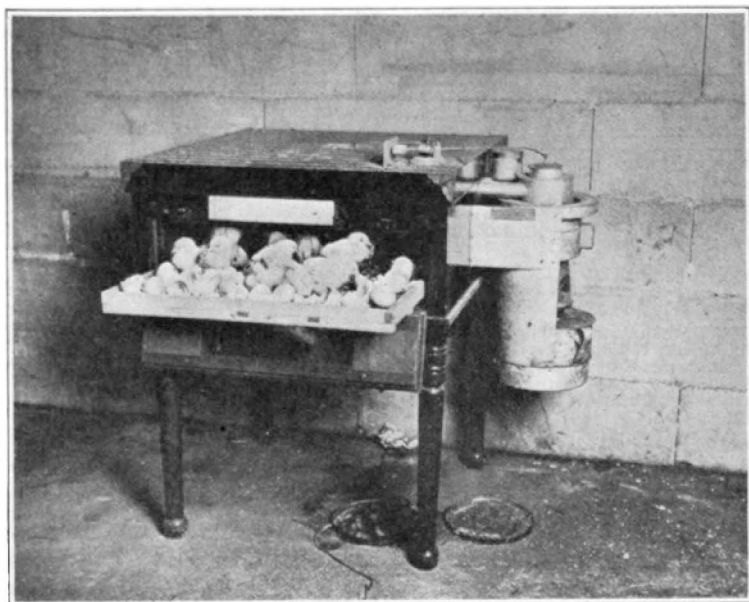
Fort Collins, Colorado

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INCUBATION AND BROODING

By P. F. SCHOWENGERDT

Instructor In Animal Husbandry



CO-OPERATIVE EXTENSION SERVICE IN AGRICULTURE AND HOME
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INCUBATION AND BROODING

By P. F. SCHOWENGERDT

Ability to hatch strong chicks and successfully care for them until they have passed the most critical period of their life is what will determine to a very large extent our success with poultry.

No matter how well we may understand the principles of housing, breeding and feeding of mature birds, unless we are successful in our incubation, brooding and care of the little chicks, we cannot continue profitably over any number of years.

The problems involved in hatching and rearing little chicks are exceptionally varied and numerous. Their solution is possible only when we understand the fundamental principles of the operations, when we study the little chicks and give them continuous attention.

PART I. INCUBATION

SELECTION AND CARE OF EGGS FOR HATCHING

To begin our incubation work correctly either by natural or artificial method, we must start with a careful selection of the eggs used. This selection should begin with the breeding stock which produces the eggs. Fowls of unknown breeding, which are lacking in constitution and vitality are not apt to produce eggs with big strong germs which will be easy to hatch into sturdy chicks. The eggs used should be carefully chosen, even when all of them come from good stock. Avoid using abnormally shaped eggs, or those which are thin shelled, rough shelled, or ridged. Exceptionally small, or large, very pointed or perfectly round ones should never be incubated. It is best to pick out a setting of eggs that are uniform as to shape, size and color.

The holding of eggs for hatching should be avoided as much as possible. The Pennsylvania Station found that when eggs were held for a period of over fourteen days their hatching power was rather uniformly diminished. Never try to hold eggs longer than two weeks. Eggs should always be kept in a flat tray so they will lie on their side. Keeping them in baskets and pails gives poorer hatching results. It has been shown by experiment that it pays to turn eggs which are kept for hatching. The best practice is to keep them in flat trays and turn at least once daily. The best place to keep eggs is in a good cellar or basement. The place should be cool and have a constant temperature. Extremes are injurious. The germ will continue to grow if the temperature is above 68° Fahrenheit and it will be injured if

allowed to chill below 40° Fahrenheit. The best temperature will be somewhere between 50° and 60° Fahrenheit.

Some persons think that eggs will hatch better if washed before setting. This is wrong. Experiments with large numbers of eggs during several seasons have shown that unwashed eggs hatched 12.5 percent more than washed eggs. Washing destroys the cuticle or protective coat of the shell. It should never be practiced unless eggs in the nest have become coated with filth. In this case, it would be the lesser of two evils.

ARTIFICIAL INCUBATION

Many people think that artificial incubation is a twentieth century invention. The fact is quite the contrary. The practice is as old as history itself. The Chinese and Egyptians had a wonderful ability to hatch eggs by means of artificial heat. They had huge dome-shaped hatcheries with capacities far exceeding any mammoth incubators of the present day. The incubator as we have it today has had its greatest development, however, within the last half century.

Hatching eggs in an incubator has always been a matter of great interest to most people. The use of the incubator is not only destined to continue, but to increase. This is due to the fact that early hatching is necessary, both in profitable broiler production and raising of winter layers. Hens will not be broody in any great numbers early enough to perform this early hatching. This, along with the fact that it costs less to hatch large numbers of chicks in incubators and because incubator chicks are usually free from mites and lice, seems to be the main advantage of the mechanical hatcher over the use of hens.

Incubators

Based on their method of heating, there are two types of incubators, hot air and hot water. The former type is usually cheaper to construct. They heat up quicker, are usually easier to regulate and they have no water tank to rust out and leak. On the other hand, they do not retain heat as long as the hot water type. They are inclined to vary with room temperatures and some claim they dry the eggs out more rapidly. The hot water type usually costs more for a given capacity and equal quality. There is always the possibility of the tank rusting out and leaking. Leaky tanks are difficult to repair. Should the lamp fail, the machine will not cool so quickly as the hot air type and the temperature is often less variable.

There is no best incubator to buy. There are good machines of both types. Equal results have been secured with both types. There is, however, considerable difference in various makes of incubators. In buying, it is always wise to buy a machine manu-

factured by an old, reliable company. A cheap machine is generally less profitable than one which costs more but which is better in material and construction. The mistake of buying too large an incubator is very common. Select the size which fits your flock, so that eggs will not have to be held too long.

Temperature

The normal temperature for incubation is about 103° Fahrenheit. When running an incubator, after the eggs have been put in, the temperature should never be allowed to go below 100° nor above 105°. All incubator manufacturers make suggestions as to the proper temperature for their machine. Very often the temperature should be below that recommended, never above. The Indiana Experiment Station after working with large numbers of eggs in numerous seasons, recommends the following temperatures for their conditions: 101° first week, 102° second week, and 103° third week. The writer, basing his opinion upon study of various experiments and personal observations, would recommend a temperature of 102° first week, 102½° second week and 103° third week.

The bulb of the thermometer in all machines should be level with the top of the eggs. It should not touch any individual egg, however, for this would cause a variation. Fertile eggs are slightly warmer than infertile ones.

Ventilation

Incubators have various arrangements for the admission of fresh air into the egg chamber. Ventilation is necessary in the incubator to supply the embryo with oxygen and to remove the carbon dioxide (a poisonous gas) given off by the developing chick. As to the right methods of controlling ventilation, probably the best recommendation one could make would be to carefully follow the instructions of the manufacturers. It is true, however, that very few incubators provide enough ventilation. Excessive ventilation, it seems, can do no harm other than to hasten the evaporation from the eggs. If this increased evaporation is offset by the supplying of additional moisture, ventilation will not have evil effects. The ventilation problem has not yet been solved. It is best to follow directions.

Moisture

The question of adding moisture to eggs during incubation has caused much discussion. Numerous experiments have been conducted. The Oregon Experiment Station found that eggs incubated artificially lost 12 percent more moisture than did those hatched under hens. This indicates that evaporation in the incubator is too rapid. The Ontario Station found that where moisture was added during incubation they hatched 11.2 percent

more chicks from all eggs set than where no moisture was added. The New Jersey Station, after using sand trays for supplying extra moisture, comes to the following conclusions: By adding moisture by means of an evaporation tray in the incubator, they were able to hatch a considerable higher percentage of chicks. The chicks hatched in the moisture machines were larger and more vigorous. Furthermore, they were more successfully brooded.

Most poultrymen of today think it is almost impossible to get too much moisture. The best means of supplying moisture is by using a large shallow pan, filled with sand and puddled with water, in the bottom of the machine. Another good way is to keep the floor of the room in which the machines are run, wet each day where this is possible. Don't be afraid of getting too much moisture. Under Colorado conditions, it appears to be the greatest difficulty to get enough. Use the extra moisture from the beginning until the chicks start to hatch.

Turning and Cooling Eggs

The germ in an egg is situated on top of the yolk. The yolk tends to float on top of the albumen when the egg lies on its side. This brings the germ in close contact with the shell membranes of the egg. As evaporation goes on, unless the egg is moved, the germ will soon become stuck to the shell membrane. This would mean the death of the embryo. It is to avoid this that eggs in the incubator should be turned. Turning moves the embryo to a new position and tends to offset any adhesion of the germ to the membranes. Turning is also said to aid some in aerating the egg.

Eggs should be turned twice daily from the third day until hatching commences. A good way is to remove some eggs from the center of the tray, roll those from the edges toward the center and place the eggs which were removed around the edge of the tray. It is also a good practice to reverse the tray in the machine at each turning. The Pennsylvania Station found that eggs which were turned twice daily hatched 66 percent of fertile eggs, while those which were not turned hatched 59 percent. It is a necessary and worth-while task.

Once each day when turning, the eggs should be left out of the machine long enough to cool. This is merely imitating nature. They should be cooled once daily from the beginning until hatching commences. They will not take so long to cool the first week as they will later. Cool the eggs until they feel just barely warm to the cheek.

Testing Eggs

It is a good practice to test the eggs and remove infertiles and those having dead germs, for it gives more room on the tray and offers a means of telling whether the breeding stock is doing its part. A tester consists of any form of light with a metal chimney having a hole or opening about the size of an egg in one side. The testing is done in a dark room by holding the eggs to the opening before the light. On the seventh day an infertile egg will appear entirely clear except for a floating shadow (the yolk). An egg with a dead germ will have a small dark spot about the size of a pea or it may also have a pink ring adhering to the shell. A living embryo will appear as a dark spot with numerous blood vessels radiating out. Because of this similarity to the shape of a spider, this stage is often spoken of as the "spider stage."

Points to Remember

The incubator should be located in a place which is well ventilated and where the temperature varies but little. It should stand solidly and be level both ways. A high corner will be a hot corner. The machine must be cleaned, disinfected and aired before each hatch. Disinfect with a 3 per cent solution of any coal tar disinfectant. Clean the soot from the lamp flue often. Keep the lamp clean and use a new wick for every hatch. One person should be responsible for the care of the machine. Regulate the machine for several days before eggs are placed in it. Always read temperatures three times daily. It is good to make a table and record the temperatures each time. Always turn eggs and place them back in machine before tending to lamp. Lamps should be filled at evening. Never fill lamp too full. Trim wick daily by scraping burnt portion off with some straight edge. Watch the temperature, make all changes in regulator gradually. Follow instructions. Take a last look at lamp before leaving for night.

NATURAL INCUBATION

It is a perfectly natural phenomenon for a hen to become broody. It is only following her instinct to reproduce her kind. Even tho incubators have been fairly well developed, the hen is still probably the surest hatcher. She also seems to hatch chicks which are a little stronger. Her usefulness, however, in this line is limited.

Where to Set the Hen

There are two systems of arranging nests for natural incubation. One is to use a separate house or room with nests built around the wall. Another is to use individual coops which can later be used for housing the hens and chicks. The "A" type of

coop is common. In either case the nest should have its entrance from the front. It should be solid, slightly darkened and rather secluded. A mistake is often made by using barrels on end for nests. In this case it is necessary for the hen to jump down on her eggs. In making the nest proper, the material should be spread out, forming a gentle, sloping, concave surface. Don't make it too deep. Just give it slope enough to keep the eggs in the center. The surface of the nest should be smooth and compact so that eggs will not fall into soft corners and get away from the breast of the hen. Nest boxes should be 12 inches wide, 14 inches deep and about 20 inches long. The nest proper is then made in the back end of the box.

How to Set the Hen

A hen for hatching purposes should be selected from one of the general purpose breeds. Heavy breeds are clumsy and break their eggs. Leghorn and light breeds, tho at first very earnest in their desire to set, soon lose that desire and are apt to leave the nest before the eggs hatch. Never set a hen that is not strong and perfectly healthy. Wait until she has been broody for several days. It is best to move a hen to a new nest after dark and confine her for a few days at least. It will be better to use china eggs for a few days until the hen is well acquainted with her new quarters.

Care of Setting Hens

When a hen is confined in a sitting position for a period of three weeks and eating at infrequent intervals, her vitality is lowered. Therefore, every means to eliminate lice, mites and disease and to induce exercise should be followed. The feed must be plentiful and nutritious. It is best to confine the hens to the nests and release them for feed, water and exercise at a regular time each afternoon. The feed should be clean, sound grain. One part corn and one part heavy oats is good and in normal times wheat used in place of oats. Clean, fresh water, shell, grit and charcoal should be before the bird each time she comes off the nest. Examine the nest and eggs while hens are off. If eggs are broken and soiled, the nest should be cleaned. Examine nests and hens for mites and lice. Treat for these as discussed in Extension Bulletin No. 138. Induce the bird to scratch and exercise a little each day for its grain, but be sure it gets enough.

PART 2. BROODING

As in incubation, the brooding may also be done by natural or artificial means. The advantages of each system of brooding are very similar to those of incubation.

ARTIFICIAL BROODING

Artificial brooding usually of necessity accompanies the use of incubators. There are many systems of brooding chicks artificially.

There is the long brooder house method. This is employed on large commercial plants. The heat is supplied by a central hot-water heater and distributed to a long row of separate hovers.

The second system of brooding is the colony house method. Here a coal-stove colony hover or smaller movable lamp hovers are placed in a colony house. These two types of hovers are illustrated in Fig. 1 and Fig. 2, respectively. Either of these forms of hovers is especially recommended. They are meeting

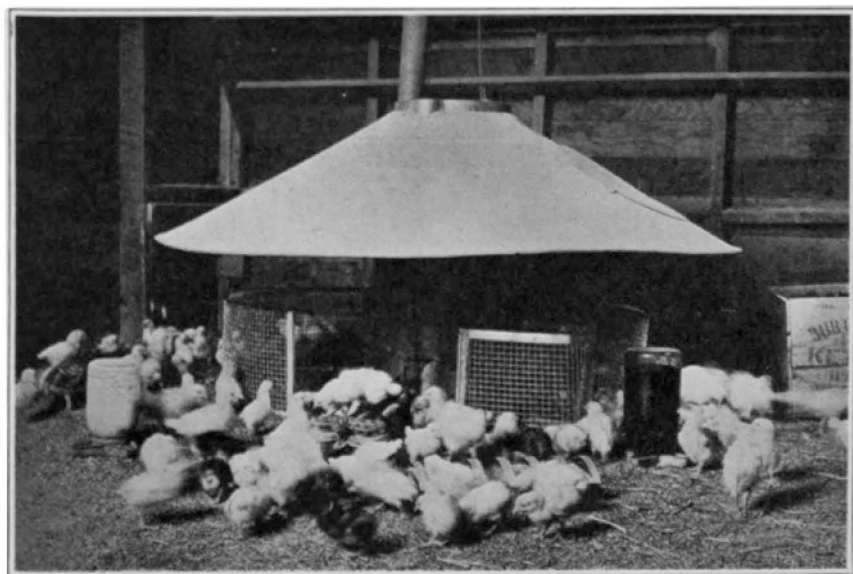


Fig. 1.—A coal-stove colony hover

with great success throughout the country. They are good because they are easier to clean and it is easier to get at the heater. Also, the temperature is better distributed. When placed in a good colony house, they are less affected by weather conditions. The house can later be used for growing stock. A third type of brooder is the box brooders heated by a lamp. These are constructed for use both inside and out of doors. Some are successful. Very often they have poor regulation of temperature, they are poorly ventilated, hard to clean and do not allow the chicks that freedom which they have in the colony house.

Essentials of a Good Brooding Device

1.—A portion of it should be warm. It should be possible

to regulate the temperature. The heat should come from above on to the backs of the chicks.

2.—Another portion should be cooler, to which the chicks can go when they choose.

3.—It should be well ventilated without drafts. Where numerous chicks are crowded into small quarters, there is a lack of fresh air.

4.—It should be dry. Dampness causes digestive troubles and chilling.

5.—There should be an abundance of sunlight in all parts. It will keep the chicks lively and act as a disinfectant.

6.—There should be ample room for the chicks. Most commercial brooders are rated at about double their capacity.

7.—The whole should be easily cleaned and all mechanical and heating parts easily accessible.

8.—It should furnish protection from pests and vermin.

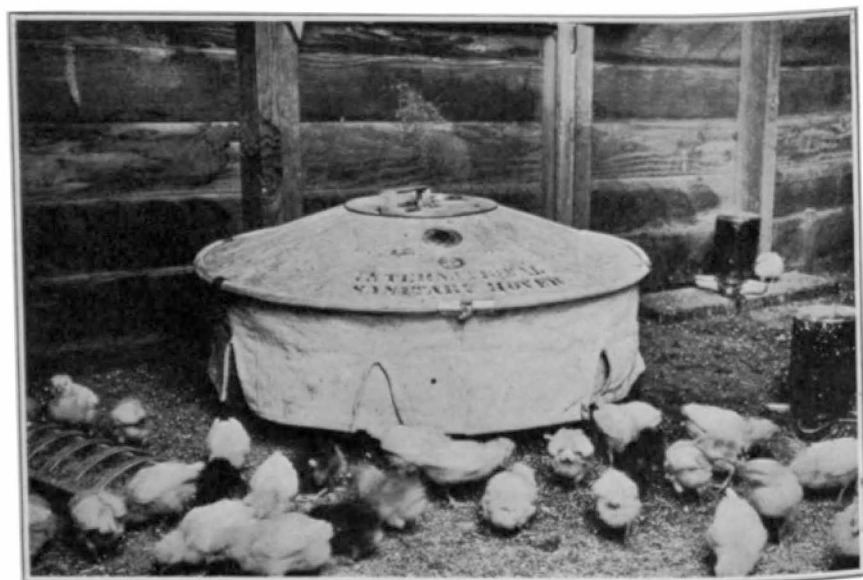


Fig. 2.—A movable lamp hover

Proper Brooder Temperatures

The brooder should be started in advance and carefully regulated before the chicks are placed in it. Extremes of temperature should be avoided. Chilling causes winginess, digestive troubles and weakness generally. Over-heating causes smothering, lowering of vitality and leg weakness. The following temperatures are recommended: 96° to 98° for the first week, 95° for the second week, 90° to 92° for the third week and 85° for the

fourth week. Gradually reduce by 5° each week until 70° is reached.

After one has had some experience in brooding, observation of the chicks will be the best guide as to temperature. When chicks are contented, active and doing well the temperature very likely suits them. If they huddle and peep and crowd, they are too cold. If they are too warm, they will gap, be drowsy, be inactive and appear lifeless.

Management of the Brooder

The brooder should be well regulated before placing chicks in it. When taking chicks from an incubator which is 103° it is best to have the brooder 98° at least at the start. The chicks should be moved carefully and in small lots. Remember not to overcrowd the brooder. Where several groups are brooded at the same time, an extra brooder is advisable in case of accident. The first four weeks of the chick's life are the most critical. They are delicate and have slight resistance to disease. Therefore, keep the brooder clean and sanitary. Avoid overheating and chilling, they are equally bad. It is good to get the chicks out on the ground as soon as possible. Nothing is better for them than to exercise and come close to "Mother Earth." Even if the weather is rather brisk, when it is not wet or too windy, have them out. See to it, however, that they know where to get warm. Care for the lamp daily.

NATURAL BROODING

Brooding of chicks with hens is quite successful for small numbers. The hen naturally has the ability to care for the chicks, to procure for them large amounts of animal food and she induces them to exercise.

Brood Coops

Where chicks are brooded by hens, they are usually sheltered in small brood coops. The coops, if well built so as to protect the chicks from vermin and bad weather, are quite satisfactory. They may be moved about on range. The "A" type of coop is most popular. They should be built with the floor a little larger than the coop. The top part is removable or is hinged to one edge of the floor. This makes easy cleaning and the coop can be lifted and sunned each day. The sloping sides which form the roof should be closely matched and water-tight. The back end is closed tight, except for the small ventilation hole which is sometimes bored near the gable. The front of the coop should be made of close-mesh wire screening and a door should be arranged so the chicks can be free to come and go while the hen is confined to the coop. A good size to build such coops is 3 feet wide, 4 feet long and about 30 inches high at

the point of the roof or gable. These coops are also suitable to set the hens in, placing the nest in the back end. Coops of this kind should be neatly made, painted and stored in a dry place when not in use, so they will last several seasons.

Management of Hens Brooding Chicks

The hens should be confined to the coops for a week or ten days, depending on the weather.

The chicks, after a day or two, are allowed to range around the coop if the weather is at all nice. Whenever the weather is wet or dews heavy, the chicks should be confined to the coop until the grass is dry. The coops should be placed far enough apart so the hens will go to their own coop. Each night the coops should be examined to see that the hens are in their proper places and not two hens in one coop. The coops must be constructed so as to exclude rats and cats and it is preferable to close the wire door each night on this account. The coops should be opened back or the roof part upturned, and thoroughly cleaned and sunned each day. They should be disinfected with 5 percent solution of some coal tar dip every few days. Never put too many chicks with one hen, 15 in early spring and 25 in late spring is the limit. Move the coops to fresh range frequently.

FIRELESS BROODERS

The fireless brooder has aroused considerable attention during the last few years. The principle of these brooders is that the chicks constantly give off body heat. If the chicks are kept in a small space and their body heat retained, no additional heat is needed. The principle of heating is correct and the chicks will be warm enough, but the ventilation in such a brooder is very poor. Fireless brooders can be purchased or made at home. To make a fireless brooder, use a good strong, well made box about 2 feet square and 12 inches deep. Provide a small opening about 4 inches square in one side. Blankets or old woollen material are used for a covering for the chicks. Covering should be of several thicknesses. The amount to place over the chicks varies with the weather. The blankets can be laid over the chicks so they gently rest on their backs.

In a brooder of this size not over 35 chicks should be hovered. Never keep large numbers of chicks in a fireless brooder. They are suited only to use for small groups. This type of brooder is of course intended for use in a moderately warm room or building. The chicks often become overheated at night and suffer for lack of fresh air. The brooder gives rather good results, however, where used for small numbers, operated in a warm room and given constant attention. It is cheap and easy to make.