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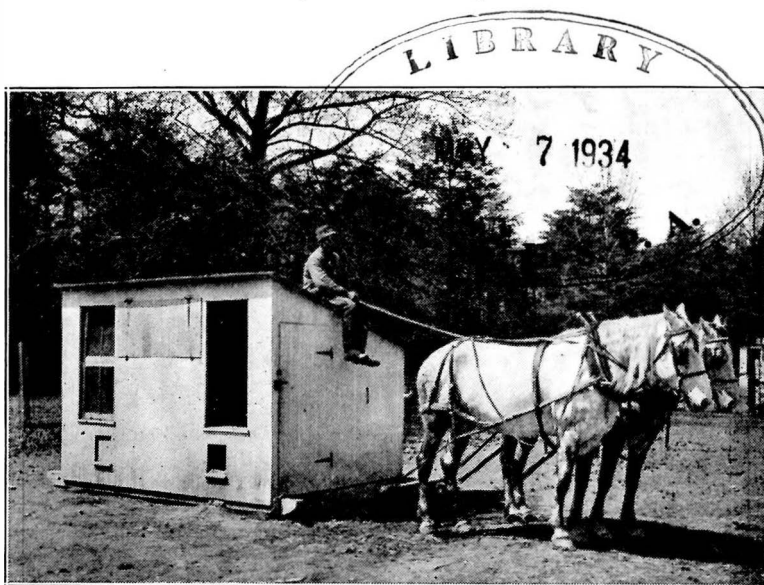
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Chick Brooding, Feeding, and Management

By W. C. Tully



Clean ground is essential in raising good chicks. The brooder house should be moved several times each year.

**Department of Poultry Husbandry
Agricultural Experiment Station
South Dakota State College of
Agriculture and Mechanic Arts
Brookings**

“Grow Healthy Chicks”*

1. Clean Chicks

Obtain chicks from parent stock that are not reactors to a test for pul-
lorum disease, formerly called bacillary white diarrhoea.

2. Hatch Chicks Early

Hatch chicks of the general purpose breeds such as Orpingtons, Plym-
outh Rocks, Rhode Island Reds, and Wyandottes NOT later than April 15;
and light breeds such as Leghorns NOT later than May 15.



3. Clean Brooder House

Follow the steps listed below in preparing the brooder house for chicks.

- Clean, scrape, and sweep the floor and sidewalls.
- Scrub brooder house thoroughly with boiling lye water, using one pound of lye for each 20 to 25 gallons of water.
- Allow the house to dry for two or three days.
- Disinfect brooder house with a reliable disinfectant such as a five per cent solution of compound cresol (sheep dip) using 12 tablespoonsful of cresol to each gallon of water.

4. Clean Feed

Feed both grain and mash only in hoppers, never on the ground or floor. Have all hoppers so arranged that chicks cannot contaminate their feed with droppings. Chickens are by nature filthy creatures and their feed must be kept clean.

5. Clean ground

Raise chicks on ground that has not been used for poultry of any kind for at least one year. Under no condition allow young and old poultry to mix at any time.

*Further details of the grow healthy chick plan may be obtained in Extension Circular Number 270.

Chick Brooding, Feeding, and Management

W. C. Tully

Good Breeding for Egg Production.
Good Housing.
Proper Feeding.
Sanitation and Management.

These are the four fundamentals of successful poultry production. While it is true that the greatest need of the Northwest is better bred laying stock, neglect of any of these essentials will result in lowered income from the poultry enterprise.

This circular is written to present a starting and growing ration that has been tested on thousands of chicks, including all those raised at the South Dakota experiment station for the last three years, as well as additional information on chick management.

How Many Chicks

In planning the poultry work for any year the number of chicks to be raised is one of the first points to be decided.

Laying birds should not be kept more than two years, except in the few cases where trap-nesting and individual pedigreeing are done, when a bird may sometimes be kept longer than this as a breeder. A very good ratio of pullets to hens in the flock is 60 per cent of the former and 40 per cent of the latter. This means that we have to raise enough pullets each year to replace 60 per cent of the laying flock. If 100 layers is the size of the average farm flock 60 pullets will be needed that are satisfactory to keep in the laying house. At least 10 of the matured pullets will not be satisfactory to keep through the winter, which means we must plan on maturing 70 pullets. With 70 pullets, assuming the normal male-female ratio of 50-50, we have also 70 cockerels, or a total of 140 matured young stock. Some of the cockerels may be sold earlier of course. Allowing for 20 per cent mortality throughout the growing year, we must therefore start 175 chicks in the spring.

Not more than 250 chicks should be started in the standard size 10 x 12 foot brooder house, but even with only this number, the cockerels must be removed at eight weeks of age or before to another house. Very often the extra pullets raised over our own requirements can be sold to advantage in the fall of the year. In the great majority of years there is no difficulty in selling pullets for laying purposes, if the pullets are properly raised and are good ones. Let us plan on starting 250 chicks in the brooder house.

What Quality of Chicks?

In buying chicks buy the best obtainable. One should remember that chicks from stock bred for high egg production cannot be produced for the price of ordinary ones. Be sure to get chicks from flocks which have been tested for pullorum disease. Buy from a reliable hatchery because

Credit is due O. J. Weisner, Extension Poultry Specialist, for valuable suggestions.

there are innumerable false advertisements with regard to baby chicks. Beware of the advertiser who has for sale chicks from a "300", or even a "200 egg strain". No such strain exists. Sometimes good chicks can be secured by having them sent from a long distance, but not unless they are bought from a reliable hatchery or poultry breeder. There are still some hatcheries that want to ship their chicks just as far away as they can so that they will be at a safe distance when the complaints start coming in.

Still another reason for buying from a reliable hatchery is that not all flocks which were supposed to have been tested for pullorum disease were by any means so tested.

Statistics for a long period show that it takes, on the average, about the value of 80 eggs to properly feed a laying hen for one year. The average production per year of South Dakota hens is approximately 80 eggs. Improper feeding methods cheapen feed costs only a little and may result in a very small profit over feed for average hens, but when costs of stock replacement and housing are added average hens actually lose money for their owners. Profit eggs are the eggs saleable after feed and other costs have been paid. The following table is worth careful study.

Average number of hens for the year	Average production per hen	Profit eggs over feed cost
100	80	0
100	90	1000
100	100	2000
100	125	4500
100	150	7000
100	200	12,000

Table 1: Average production per hen per year has a tremendous effect on profits in poultry raising.

If "average" chicks from an "average" flock sell for example at eight cents each and half of the matured chicks are pullets that lay 80 eggs each per year the profit will be negligible. If on the other hand chicks which sell, for example, at 12 to 15 cents each develop pullets that will lay 150 eggs each year under identical feeding and management, they will return a profit over feed cost of 70 eggs per year. At an average price of fifteen cents per dozen for eggs this latter class of stock would be worth several times the usual selling price. Well bred stock is so essential to profits in poultry raising that every purchaser would be much better off to purchase fewer chicks, if necessary, but to get the very best available.

What Variety of Chicks?

Do not change the variety of poultry kept, if dissatisfied with results, to some very common variety on which very little breeding for egg production has been done. If your entire flock must be changed to improve the quality, be sure to get not only standard quality, pure-bred chicks, with definite breeding for egg production back of them, but also get one of the more common varieties that has been popular for years. In selecting such a common variety one has a much better chance of getting rea-

sonably good egg production quality than by selecting some rare and generally unpopular variety that has little definite breeding for egg production back of it.

A common poultry question is: "What is the best breed, or variety, of chickens for the general farm?" The answer to this is that there is no best breed. The strain of a particular variety, or what breeding for egg production is back of it, is a great deal more important than the breed or variety. For example, well-bred Barred Plymouth Rocks will outlay by many eggs in a year, Single Comb White Leghorns that have no particular breeding back of them. The latter may be pure-bred, but that in no way implies that they will be good layers and money makers. In the same way, Single Comb White Leghorns with definite egg production qualities bred into them will outlay and outpay any other variety with no definite egg production breeding. For general farms of South Dakota, any of the dual-purpose birds, definitely bred for egg production, are recommended. There is no truth in the statement that any one variety or breed of chickens is more subject to disease than any other.

Brooder House Management

The thorough cleaning, scrubbing with lye water, and disinfecting of the brooder house are described in Circular No. 270.

The first important point in chick brooding is to be sure the brooder stove is large enough. Too much heat can be easily avoided by proper ventilation, but if on a cold March or April night your brooder stove will not give enough heat, there is not much one can do about it. It is unfortunate that in advertisements of brooder stoves and hovers, the capacity of the equipment is almost universally doubled. If one wants a brooder stove to brood 250 chicks, the "500 chick size" is the right size to have. Be sure to buy a good brooder stove with a large coal capacity, as a few dollars saved in the purchase of this piece of equipment can be lost many times over in improper operating results.

Be sure to start the brooder stove at least two days before expecting to get the chicks, and three days is much better. This gives an opportunity to regulate the stove and see that it is going to operate properly. Unless electricity is available, coal burning brooder stoves or a few of the more recent oil burning brooders are the most satisfactory. Coal burning brooders are designed and built to burn chestnut size hard coal, and nothing else. Soft coal can be burned, in some stoves only, by fixing the fire at midnight, again at 5 a. m., and several times during the day, but the extra work involved, together with less satisfactory results, more than offset the saving made in the price of the soft coal. It will take about one-half ton of hard coal to run a brooder stove for one brooding period of 8 to 10 weeks, the length of which of course depends on the time of year the chicks are started and the weather prevailing. The supply of coal should be on hand at the beginning of the brooding season.

The brooder temperature for the first week, taken with the thermometer hanging from the edge of the hover so that the bulb is two inches from the floor, should be between 95 and 100 degrees. Have a good thermometer and don't guess at the temperature. Another good thermometer should hang on the wall of the brooder house about five feet from the floor

and this should not read more that 70 to 75 degrees at any time. It is difficult to keep the proper room temperature, at the same time keeping the hover temperature right. In nine brooder houses out of ten the room temperature will be 85 to 90 degrees. This is far too high and shows a lack of proper ventilation. The proper moisture in the brooder house is also very important and often completely neglected. Too dry an atmosphere may result in poor feathering, and dry, brittle feathers. Maintain at least a reasonable amount of moisture in the house by keeping a pan of water on top of the brooder stove all the time. The amount of water evaporated in a day will be surprising.

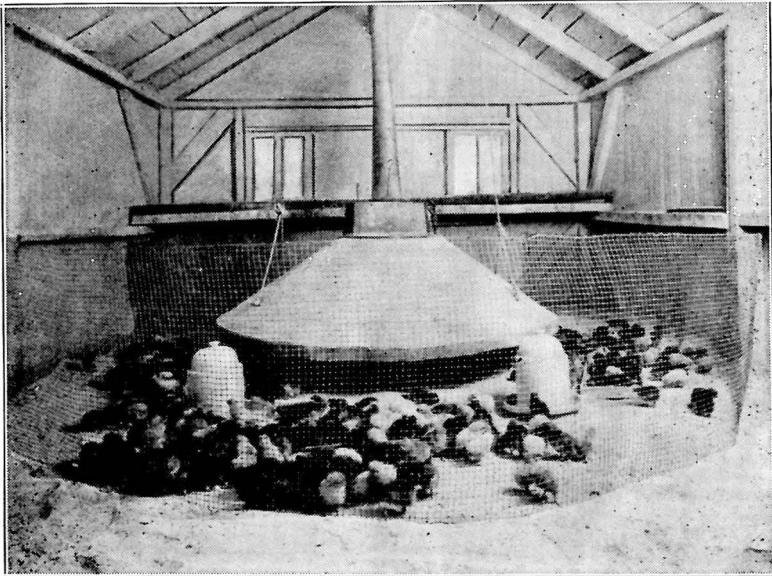


Fig. 1.—A wire netting, or roll of tar paper cut in half lengthwise, surrounding the brooder stove at some distance from it, helps to keep the chicks near the source of heat. This is very important for the first few days of brooding.

The following table shows the proper hover and room temperatures for the first eight weeks of brooding.

Table 1
Hover and Room Temperatures

Hover temperature under edge of hover and 2 inches from floor	Room temperature
First week 95 to 100	70 to 75
Second week 95 to 100	70 to 75
Third week 92	70 to 75
Fourth week 88	70 to 75
Fifth week and on, gradually reduce till no more heat is required, which will usually be about 8 weeks.	

The length of time to continue heat in the brooder stove varies so much that no definite rule can be set. Dual-purpose chicks started April 15 will usually need heat for at least 6 weeks, depending to a great extent on outside temperatures. Warm days and cool nights are dangerous to brooding operations, and it is better to keep the brooder stove going very slowly during the day than to make a fresh fire every night. Chicks started early in March will need heat for at least eight to ten weeks.

During the first few days of brooding, the chicks should be confined to the vicinity of the brooder stove by means of a roll of tarpaper, cut in two lengthwise, and circling the hover, starting with the paper about two feet from the edge of the hover. Gradually enlarge the space daily by using more of the half roll of paper till about the fourth or fifth day when the paper guard may be dispensed with, as by this time the chicks will know where to go when they want heat. After this the chicks should be prevented from huddling in the corners of the brooder house by rounding these with hardware cloth through which air can pass and thus prevent suffocation of some of the bottom chicks in case they do pile up in the corners.

Kind of Litter to Use on the Brooder House Floor

Alfalfa leaves make the best litter. Cut straw is the next best choice, but whatever the material used there should be a covering of at least one and one-half inches on the floor. Planer shavings make good litter, but add to the brooding cost and are often unobtainable. Sand is not suitable for litter as it is heavier than droppings and the latter stay on top of the litter instead of being at least partially buried.

Banding Chicks

Chicks should be marked as soon as they are placed in the brooder. A chick punch or chick leg or wing band should be used. If not an easy way is to cut the web between the first and second toes on one foot, using an ordinary pair of shears. If a sharp knife is used place the chick's foot on a board or block, then cut through the web, cutting back to where the toes join.

The reasons for banding or marking chicks in some way well justify the small expense of money and labor.

The selection of next year's breeding stock should begin almost as soon as the chicks are hatched, for the first chicks hatched are usually the strongest most vigorous birds in the flock. They usually show the most rapid growth and should be marked before the others catch up with them at maturity.

Culling of hens which have passed their second year's production is a recommended practice. Unless chicks are marked, there is no accurate way to tell their age as hens. Though difficult at times, it is usually possible to tell a year old pullet from a two year old hen, but to tell the latter from a hen three or four years old cannot be done with any accuracy.

A few simple ways of marking chicks are shown. Others may be worked out. Do not cut off chick's toes or toenails as a means of identification. This is cruelty to animals. It may start toe-picking.

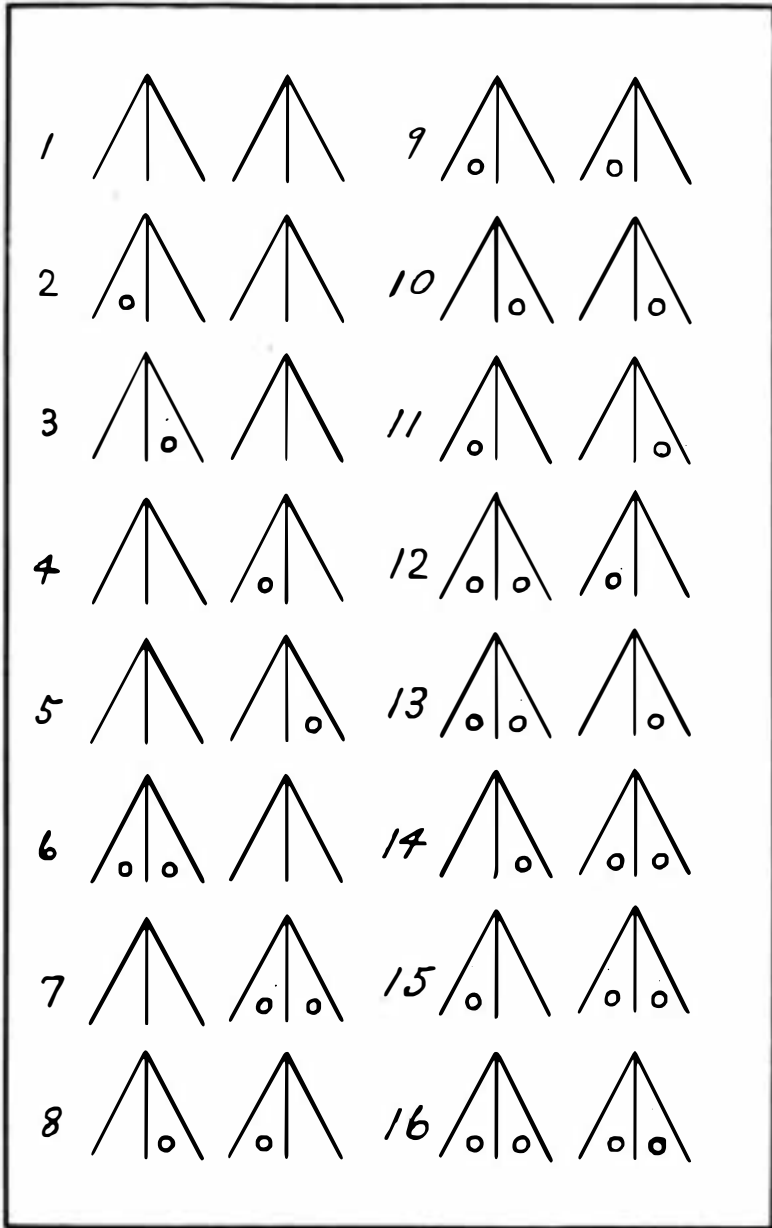


Fig. 2.—Methods of cutting or toe punching the webs of chick's feet for identification. Wing bands are better as they are permanent.

Roosting Space

When chicks are fairly well feathered, or at from three to four weeks of age, low roosts should be provided in the rear of the brooder house. It is a great deal easier to teach chicks to roost when they are young than later. In fact, chicks raised to 12 weeks of age, or sometimes older, without having had roosting facilities in the house will be difficult to get to roosts when these are finally provided.

Be sure to provide plenty of roosting space. The roosts may be only at the rear of the brooder house, or may be around two, or even three sides as the following diagram shows:

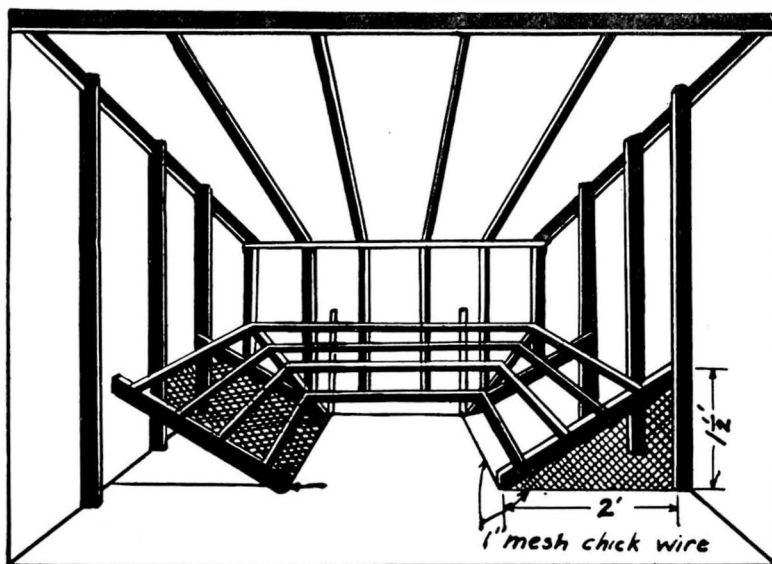


Fig. 3.—Chick roosts arranged as shown generally encourage early roosting, especially if placed in the house while the brooder stove is still in use. Wire netting prevents the chicks from crowding underneath the roosts and keeps them away from the droppings.

Materials Needed

- 24 linear feet of 30-inch chicken wire having 1 inch mesh
- 1 pc 2 in. x 4 in. x 10 ft. for supports
- 1 pc 2 in. x 4 in. x 12 ft. for supports
- 80 linear feet of 1 in. x 3 in. for perches

(Illinois Agricultural Experiment Station.)

Separate Sexes at Eight Weeks of Age

When dual purpose varieties reach the age of eight weeks the cockerels should be separated from the pullets and housed in a separate house. Leg-horns and other light breeds can be separated before this time. Pullets will not properly mature and make the growth they should if males are with them. Limited space in the brooder house demands this practice as well.

With some of the Rose Comb breeds it may be a little difficult to tell

males from females. In females the saddle feathers on the sides of the back will be rounded at the ends while in males these same feathers will be more pointed. Males also have an altogether different voice than the females. Males will usually be somewhat larger at eight weeks of age. Separate sexes as accurately as possible and the remaining cockerels, if any have been missed, can be removed from the pullets at a little later date.

Glass Substitutes in Brooder Houses

With one or two exceptions, which have been put on the market only recently, we do not advise the use of glass substitutes in brooder houses, or in laying houses. Tests by the Bureau of Standards have shown that all but one or two of the glass substitutes now on the market and advertised for poultry use, after a short period of exposure to the sun, or solarization, lose their power of transmitting the effective part of the ultra violet rays. Some of them, even when new, transmit such a small amount of effective ultra violet rays that their use would be questionable. With few exceptions, glass substitutes are not permanent, and even for this reason alone, are too expensive.

Chick Feeding

When to Feed.—Baby chicks should be put under the hover of the brooder when they are from 24 to 36 hours of age and given their first feed at that time. Contrary to old ideas, chicks will not be injured by feeding before this time, but on the other hand no advantage is to be gained by feeding before the 24 to 36 hour age. Late afternoon is the best time to put chicks in the brooder house, but whenever this is done, be sure all the necessary feed hoppers are in place, so that the chicks can eat feed and not litter.

What to Feed

Chick rations are as numerous as the varieties of chicks themselves, but a ration formulated by your state experiment station will give good results. Do not mix up some cornmeal, oatmeal, and perhaps a little hard-boiled egg, and call this a chick mash. The ration given below has been tested on thousands of chicks and will give completely satisfactory growth. In a few localities some of the ingredients for the formula cannot be obtained and in such cases a commercial ration made by a reliable company may be used. Commercial rations will be more expensive than a complete and properly balanced ration which can be mixed at home. In the College Ration all the ingredients must be put in and the mash thoroughly mixed, at least five or six times, until it is an even color and texture throughout. The College Chick Ration is a combination of mash and grain which we prefer to the all-mash method of feeding. The following is the formula for the mash part of this ration.

Starting Mash

Lbs.

- 31 ground yellow corn
- 15 wheat bran
- 15 wheat middlings
- 15 oatmeal, rolled oats, or pulverized oats*
- 10 meat and bone scraps
- 10 dried buttermilk
- 1 common fine salt
- 2 pulverised oyster shell or limestone.
- 1 cod liver oil or sardine oil (1 pint equals 1 pound).

100 total.

*Pulverized oats are those ground in a hammer mill so that the hulls are finely ground. An ordinary burr mill will not pulverize oats.

Only three changes are justified in the above formula.

1. If some liquid skimmilk or buttermilk is available for the chicks the dried buttermilk in the mash may be reduced to five per cent, replacing the five per cent removed with ground yellow corn or ground barley.

2. If sufficient milk is available so that it can be left in front of chicks at all times, the 10 per cent of dried buttermilk in the mash can be replaced with ground yellow corn or ground barley.

Do not use less than 10 per cent meat and bone meal.

3. Ground barley may be substituted for the ground yellow corn, in whole or in part, up to 31 per cent, if 5 per cent of alfalfa leaf meal is added to the mash, and cod liver oil is fed until chicks are on green range.

Alfalfa meal which analyses 25 to 30 per cent crude fiber is of questionable value for poultry feeding purposes. Alfalfa leaf meal, which should not contain more than 15 to 18 per cent fiber is much better but often difficult to obtain. Green cut alfalfa, or alfalfa pasture, when available are invariably better than either alfalfa meal or alfalfa leaf meal.

Thirty per cent of ground wheat cannot successfully be used to replace the 15 per cent each of wheat bran and wheat middlings used in the mash.

Only a cod liver oil or sardine oil tested for vitamin D potency should be used and the oil will mix with least difficulty with the wheat bran before the mash is mixed up. Mix the bran and oil thoroughly by hand, and then mix this with the remaining mash ingredients. Cod liver oil must be supplied as long as the chicks are confined to the brooder house. As soon as they are allowed access to direct sunlight (not through window glass) the cod liver oil may be omitted from the ration. This will usually be when the chicks are from two to three weeks of age, but will depend of course on the season and weather conditions.

How to Feed

The mash ration is fed for the first few days in shallow hoppers which may be made of lath. Keep plenty of mash in front of chicks all the time as there is no danger of chicks over-eating if a correct ration is fed. Provide plenty of mash hopper space, two inches for each chick. For 250 chicks, five mash hoppers four feet long will be needed. When the chicks

are a few days old they can be fed from regular size chick mash hoppers. A satisfactory hopper is four inches wide, four inches deep, and four feet long. Provide a reel running the length of the hopper to keep the chicks out.

Provide plenty of water fountains and keep a supply of clean water, or milk, or both, in front of the chicks at all times. Use pure water, do not dope it up with pills or concoctions which are supposed to cure all kinds of incurable diseases. Keep water and milk fountains clean by thoroughly scrubbing each day. It makes no difference whether liquid milk is fed sweet or sour. Either will give excellent results. Milk may safely be fed in galvanized containers, but as a safety factor when using a galvanized milk container the first time allow sour milk to stand in it for 24 hours and then throw this milk away.

The grain ration which is fed with the above mash ration is started when the chicks are eight to ten days old and is made of the following ingredients:

finely cracked yellow corn 40 per cent
cracked wheat 40 per cent
steel cut oats 20 per cent

or the oats may be omitted using equal parts of finely cracked yellow corn and cracked wheat.

This grain ration is also fed in hoppers, never on the ground or floor. Provide one hopper of grain to every three of mash, and leave the grain, like the mash, in front of the chicks at all times.

Growing Rations

When the chicks are eight weeks of age, two changes are made in the starting mash given above to change it to a growing mash. First, the dried buttermilk is reduced to five per cent, making up the five per cent removed with ground yellow corn or ground barley. Second, ground oats may be substituted for oatmeal or rolled oats if these were used instead of pulverised oats in the starting mash.

In the grain ration, at the same time, the finely cracked yellow corn, can be replaced with intermediate cracked yellow corn, and cracked wheat with whole wheat. If steel cut oats have been used omit them as they are too expensive to continue. Whole oats may be used but never more than 10 per cent and often chickens will not eat this amount. Chick size granite grit should be fed in separate hoppers at ten days of age when the grain ration is started, and should be always available afterwards. Do not confuse granite and limestone grit. Most of the grits on the market are not true grits but only limestone. Chick size oyster shell, or finely cracked limestone, should be available in hoppers at all times after chicks are four or five weeks old. Continue the growing mash and grain ration, leaving it in front of the chicks at all times so they can have all they want of both, until pullets are mature and ready for the laying house and the change to the laying mash. One of the greatest mistakes poultry raisers make is not to feed chicks a complete mash and grain ration throughout the summer and fall. This results in pullets being stunted, more readily susceptible to disease and parasites, and not matured and laying by early fall when egg prices are at their best. Don't stint on the feed.

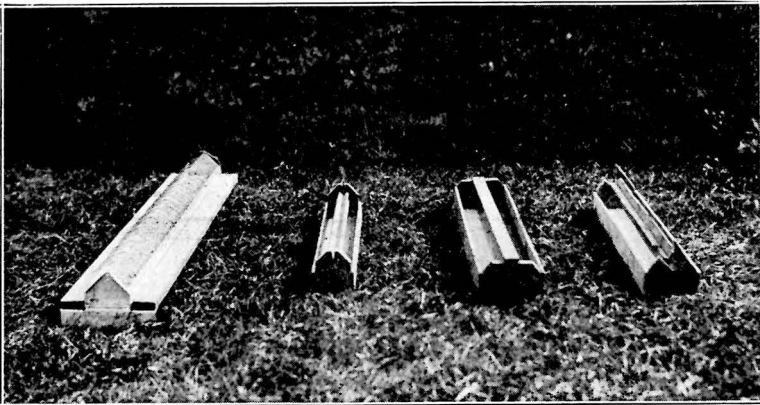


Fig. 4.—Types of chick feeders protected by revolving reels. The one on the left equipped with a wire grid, the wires running across the hopper, is much more satisfactory.

Outside range hoppers will be necessary when the chicks are put outside at about three to four weeks of age. These should be of large size, and weather proof. Plans of a range hopper are available at the college but a man handy with tools can make one from the accompanying Figs. 5 and 6. Like the brooder house, the range feeders and water containers should be moved, but these even more often than the house. Move the hoppers and water containers to a different location on the range at least once a week to prevent the ground being too badly contaminated at any place.

Feed Consumption By Chicks

The following table shows the amount of grain, mash, and total feed used by 100 chicks up to various ages.

Feed consumption, Mortality, and Weight of Barred Plymouth Rock Chicks Grown in Confinement. (Charles and Kandel, 1928).

WEEKLY FEED CONSUMPTION PER 100 CHICKS						
Weeks	Grain pounds	Mash pounds	Total pounds	Per cent mortality	Pullets average weight in pounds	Cockerels average weight in pounds
1	0.63	25.53	26.16	0.84	0.117	0.117
2	5.08	15.25	20.33	0.00	0.179	0.179
3	7.63	17.37	25.00	0.00	0.305	0.305
4	11.87	29.66	41.53	0.00	0.408	0.451
5	15.68	34.32	50.00	0.00	0.578	0.603
6	18.86	36.86	55.72	0.00	0.733	0.771
7	37.50	47.03	84.53	0.42	0.955	1.03
8	23.60	34.55	58.15	0.00	1.15	1.26
Total	120.85	240.57	361.42			
9	37.92	51.28	89.20	0.42	1.38	1.57
19	65.32	60.08	125.40	0.00	3.73	
Totals to 19 weeks	800.72	825.15	1,625	3.38		

It will be noted from the above table that one chick up to eight weeks of age uses 2.4 lbs. of mash and 1.2 lbs. of grain or a total of 3.6 lbs. Up to 19 weeks of age one chick would use on the average 8.25 lbs. of mash



Fig. 5.—Range feed hoppers.

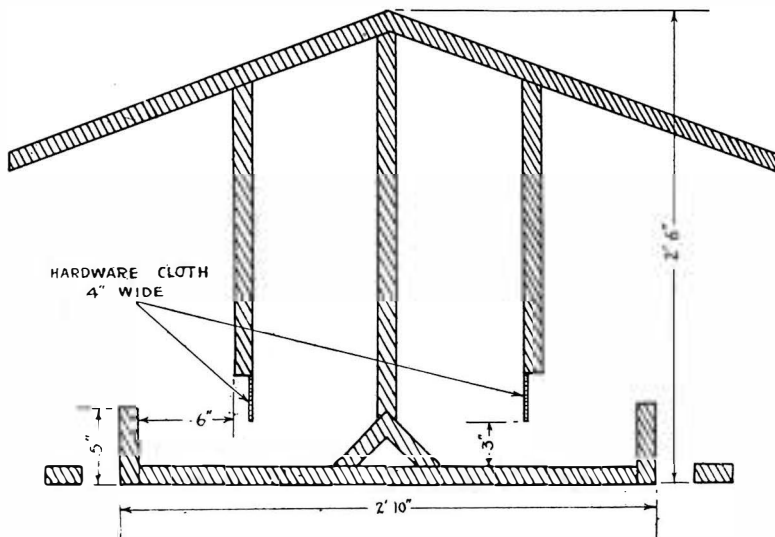


Fig. 6.—Cross section of range hopper.

and 8 lbs. of grain, or a total of 16.25 lbs. It will take approximately a total of 20 to 25 lbs. of mash and grain to raise White Leghorns to maturity, and a total of from 25 to 35 lbs. of mash and grain for dual purpose breeds such as Plymouth Rocks, Rhode Island Reds, Wyandottes, etc. White Leghorn pullets should mature in approximately 180 days, while the dual purpose varieties take 200 days.

As feed prices vary so much from time to time, it would not be practical to quote feed costs in a circular of this type. However, anyone with a very little figuring can, knowing the cost of the mash and grain they are using, easily figure the feed cost of raising any number of chickens to eight weeks or to maturity. Where both mash and grain are left in front of chickens at all times, about equal quantities of each will be used over the entire growing period.

Chick Vices

Feather pulling and especially toe picking cause great losses in chicks and should be guarded against carefully.

Feather pulling is practically always due to an improper ration.

Toe picking is due indirectly to many varied causes, only some of which are controllable. Overcrowding and poor brooder management are often responsible; but an improper ration will without question accentuate this bad habit. One of the more common causes is insufficient hopper space, resulting in chicks often picking at each other, particularly at other chicks' toes, when they cannot get at the feed. In some few cases toe picking will occur in the best fed and managed flocks.

The remedies are as follows: where only a few chicks are affected, immediately remove these chicks and paint their toes with tar. If many are affected, it may be necessary to darken the brooder house partially. Getting the chicks outside will help, but with early hatched chicks this may be difficult. There are on the market several red colored, evil-smelling, and worse tasting salves to be used for toe picking. Some of these may have merit but often have to be used repeatedly.

Important Chick Diseases

Two diseases of chicks, pullorum disease and coccidiosis are so closely related to chick management that a circular on this subject would be incomplete unless these were at least briefly described.

Pullorum Disease

Pullorum disease, formerly called bacillary white diarrhoea, is an acute, infectious, bacterial disease which costs American poultry raisers at least \$10,000,000 each year. This loss could be entirely or almost entirely prevented. According to the United States Department of Agriculture, ten per cent of the one billion eggs hatched annually in this country produce chicks affected with this disease.

Pullorum disease is the only one definitely inherited from the parents, through the hatching egg, to the chick. It is undoubtedly the cause of more deaths in chicks during the first two weeks of brooding than any other disease. If chicks infected through the egg were the only ones to contract the disease, the loss would be tremendous, but each infected chick spreads the disease to others in the flock. The result is that the mortality which is usually greatest between the third and tenth day of

brooding, amounts to from 10 to 50 per cent. Once the chick contracts this disease from any cause, only one of two things can happen. Either it dies, or recovers and becomes what is known as a carrier to spread the disease to others in the flock. Any infected bird will carry on the disease to the next generation.

Symptoms of the Disease in Chicks

Chicks are unthrifty, may show a diarrhoea, often have ruffled feathers, and in some cases stand inactive with their eyes closed, often giving a chirp characteristic of an uncomfortable chick. None of these symptoms however is a positive indication of pullorum disease. One of the most unfortunate features of this trouble is that the disease does not get the blame for loss of a great many chicks. One of the reasons for changing the name of bacillary white diarrhoea to pullorum disease is that in many cases affected chicks show no diarrhoea. Here at the South Dakota Station, and probably at all the others, each year we get samples of feed to analyze which the owners report are killing their chicks by the dozen. When losses occur, the feed often gets the blame. Perhaps in one case in ten the feed is at fault. Similarly chilling, overheating, over or under-feeding and other worries of chick brooding are blamed for death losses where in many cases pullorum disease is the real trouble.

Chicks that die from this disease usually show lesions from the size of a pin point to one eighth of an inch or more in diameter on the lungs, and less frequently the smaller lesions on the heart. While some poultrymen and veterinarians take these as positive evidences of pullorum, this practice is in error as this disease can be accurately diagnosed only by a bacterial examination in the laboratory.

An unbelievable sum of money is wasted each year trying to cure this disease in chicks. Despite numerous advertisements to the contrary, nothing can be put in the chicks' drinking water to prevent, cure, or stop the spread of this trouble. This has been proven by many definite experiments. Strict sanitation will undoubtedly stop to a certain extent the spread of this dread disease from infected to non-infected chicks, but once a chick is infected there is absolutely no cure.

Pullorum disease can be almost entirely prevented by testing the breeding flock and removing the reactors. The simple and cheap stained antigen test, perfected three years ago by workers in the United States Department of Agriculture can be used by anyone after a very little training. It has the backing, when properly done, of not only the department but of practically every agricultural college in the country.

When the flock owner has learned the simple method involved and can do the work himself, the cost for testing, exclusive of labor, will be only slightly over one cent per bird. If help is available to handle the birds, 100 birds can be tested easily in three hours, and many hatcheries that test many birds each year would regard this number as low.

Because of the color in the antigen reactors are easily discovered after one drop each of blood and antigen are mixed on a glass slide. Full directions for the use of the antigen may be obtained with it. Stained antigen is now sold under government license by many distributors. A small investment in money and labor will repay any flock owner many times over in avoiding the chick losses from this disease.

Testing has advantages in addition to practically eliminating chick mortality from pullorum disease. There is some evidence to show that

reacting hens and pullets are not as good layers as those free of the disease. Birds with one disease are subject to others. There is definite proof that reactors are chronic carriers of the disease and spread it to other birds, thus making bad conditions worse. And finally, entirely apart from the certainty of transmission of the disease by inheritance, there is further danger that by allowing reactors to remain on the farm, pullorum disease may be carried to the new brood of baby chicks. After the breeding flock has been tested and reactors removed, it is very important not to have eggs from the flock custom hatched with eggs from non-tested flocks because the disease is often spread in incubators.

Coccidiosis

Coccidiosis is caused by coccidia which are small animal parasites visible only under the microscope. This disease causes as much or more loss in chicks, during the early growing period than any other. Most losses occur when chicks are from four to eight weeks of age, though the disease may get its start earlier or later than this. Coccidiosis is very common in South Dakota and only one experience with it will always be remembered.

There are six recognized species of coccidia but four of these as a rule produce only milder types of chronic intestinal inflammation. The other two do by far the most harm and are more common, resulting in coccidiosis appearing in two distinct forms.

The first of these is the acute form where chicks become sick and die quite suddenly. The second is the chronic form in which chicks become pale, very thin, crow-headed, and these often do not die for several weeks.

The external symptoms of coccidiosis are also of two kinds. The first is known as the bloody type and causes mortality often as high as 50 per cent of the flock if not checked in time. The affected chicks get pale in the face very rapidly and later may lose most or all of the yellow color in their shanks. They stand humped up with their wings drooping and often appear half asleep. They try to get near the source of heat. The characteristic symptom of this type of coccidiosis is bloody droppings or less frequently droppings of a chocolate brown color.

The second type of coccidiosis shows somewhat similar external symptoms except that the droppings are very watery and yellowish. Chicks' feathers become ruffled and matted together around the vent. The litter becomes very wet.

Internal symptoms of coccidiosis shown on post-mortem examination are largely confined to the intestinal tract. Depending on the type of coccidia involved the intestinal lining in different parts will show a very decided enteritis (a decided red color and inflammation due to minute hemorrhages). In the common type of coccidiosis the caeca (blind guts attached to the intestine near the vent) will be enlarged or swollen and filled with bloody material.

Prevention.—Coccidia live in a dormant stage in the soil of poultry yards, in contaminated litter, and in dirty houses, where they may stay from one season to the next. They may be carried by wind or on the shoes from one house to any other. Most cases of coccidiosis get started either by allowing chicks on contaminated ground or by coccidia being carried on the shoes or by flies from the droppings of chronic carrier hens to the chicks. After coccidia are picked up by the chicks they go through a

development and then the symptoms of the disease appear. The droppings of affected chicks are alive with coccidia but these cannot affect other chicks or spread the disease until they go through a development period outside the chick of from three to six days.

Consequently thoroughly cleaning the brooder house every four to five days will prevent almost all cases of this trouble. Chicks of course should never be allowed access to ground that has been used by any other poultry the previous year, or to mix with adult hens. To develop coccidia outside the chick warm moist conditions are favorable which may partly explain why coccidiosis is more common in wet years or in later hatched chicks. The role that flies have in spreading this disease is not known but more work may show that they are closely related. As flies are definitely known to spread at least one species of tapeworms the brooder house should be kept clean enough to keep most flies away. This is not easy, but much better than losing half the chicks with coccidiosis or through tapeworms.

Cure.—There is no cure for coccidiosis. Despite many advertisements to the contrary drugs will not prevent or cure this disease. The enteritis which is a result of the coccidiosis may be treated sometimes with satisfactory results, but this is by no means a sure cure.

Treatment.—When an outbreak of coccidiosis starts, even in a few birds, or even if it is suspected, get busy. Do not wait even to have the disease definitely diagnosed as coccidiosis. While waiting for a diagnosis very often the outbreak can be stopped. Kill and burn the few affected chicks. They will die anyway or become carriers of the disease and seldom amount to anything. Feed a mash made of 40 per cent dried buttermilk or dried skimmilk. If sufficient liquid milk is available so that it can be left in front of chicks at all times feed this and no water but in addition feed a dry mash containing 20 per cent of dried milk.

As the droppings are tremendously dangerous to chicks not yet affected clean the brooder house thoroughly every day. If the chicks have been outside on the ground the latter is contaminated and the brooder house and chicks should be moved to new ground immediately.

To each gallon of drinking water, or milk, add a teaspoonfull of the Connecticut enteritis mixture the formula for which is as follows:

Powdered catechu	8 oz.
Sodium phenolsulphonate	2 oz.
Calcium phenolsulphonate	2 oz.
Zinc sulphate	4 oz.

Large drug stores will have these drugs on hand and can make up the mixture in a short time. In some cases however, two of the ingredients will not be available so it would be well to have the mixture ordered in advance, particularly if trouble has been had with coccidiosis in previous years. Any druggist can obtain the ingredients from wholesale druggists in a short time but in most cases the mixture is wanted immediately.

Feed this treated water or milk and the buttermilk mash for three days only. Feed the regular mash and grain for the next three days and then repeat the enteritis powder and milk for another three days. This system is not a guaranteed cure for coccidiosis but it is the best treatment known at present. It will help a great deal in stopping the spread of the disease and in aiding in the recovery of chicks not too seriously affected.

Money Making Pointers

Follow in detail the "Grow Healthy Chick" Plan. It will repay any poultry raiser many times in cash returns for the small additional expense and extra labor.

It never pays to overcrowd the brooder house.

In the poultry business eggs return more money than poultry meat. Keep only stock bred for egg production.

Raising chicks with hens has too many disadvantages, of which an excessive amount of labor is not the least important.

The cheapest brooder stove seldom is the best.

Don't always blame the feed if chicks die. Disease and poor chicks cause a much greater loss.

Feed chicks a ration formulated by your State Experiment Station.

Make NO changes in a feed formula recommended by your Experiment Station without advice from that station only.

One of the greatest mistakes poultry raisers make is not to feed chicks a complete mash and grain ration throughout the summer and fall.

Eggs are cheap in the spring because the majority of hens will lay a few eggs then even under most adverse conditions.

This country can use 13,080,000,000 more GOOD eggs annually before our egg consumption equals that of Canada. It is poor quality eggs, and often BAD eggs, that play a big part in lowering consumption.

Eggs should be the chief product of the poultry farmer, with chicken meat production secondary. How much does the South Dakota Farmer make from eggs each year? From poultry meat? The following free information will help. When writing for information on poultry write to the Poultry Department at State College, but when writing for bulletins only, please write directly to the College Mailing Room.

Number Extension Circulars

- 142 How to Show Poultry.
- 145 Feeding Poultry for Market.
- 189 Killing Poultry for Market.
- 225 Useful Homemade Equipment.
- 265 Circulars and Blue Print Plans.
- 270 Grow Healthy Chicks.
- 292 Turkey Production in South Dakota.
- 295 South Dakota Type Poultry House.
- 333 Selecting Hens for Egg Production. (Culling.)

Extension Leaflets

- 18 Efficient Marketing of Eggs and Poultry.

Special Circulars

- 1 Are your Hens Spreading Tuberculosis?
- 13 Poultry Sanitation.
- 14 Caponizing and Capons.
- 15 Poultry Management. A Manual for 4-H Club Members Only.
- 26 4-H Club Farm Marketing. A Manual for 4-H Club Members Only.

Experiment Station Bulletins

- 242 Results of Poultry Feeding Experiments.
- 243 Marketing of Poultry Products.

Farmers' Bulletins, U. S. Department of Agriculture

- 697 Duck Raising.
- 767 Goose Raising.
- 801 Mites and Lice on Poultry.
- 849 Capons and Caponizing.
- 1200 Tuberculosis of Fowls.
- 1377 Marketing Poultry.
- 1378 Marketing Eggs.
- 1391 The Guinea Fowl.
- 1409 Turkey Raising.
- 1506 Breeds of Chickens. I. American Class.
- 1507 Breeds of Chickens. II. Continental Class.
- 1508 Poultry Keeping in Backyards.
- 1524 Farm Poultry Raising.
- 1533 Rat Control.
- 1538 Incubation and Brooding of Chickens.
- 1541 Feeding Chickens.
- 1652 Poultry Diseases.
- 1694 Dressing and Packing Turkeys for Market.

Experiment Station Circulars

- 14 Better Rations, More Eggs, Greater Profits.