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(REVISED)

Brooding Chicks Artificially

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PRECAUTIONS AND SUGGESTIONS

1. Regulate the brooder to supply uniform and sufficient heat. Run the brooder stove for two or three days before putting the chicks into the house.

2. Feed the chicks when they are put into the brooder. If the chicks are not fed immediately they may eat too much sand, thus causing digestive troubles.

3. Use only materials of good quality in making up chick rations.

4. Allow sufficient feeder space to prevent crowding. Provide ten linear feet of feeder space for each 100 chicks.

5. If liquid milk is used, clean the feeders daily.

6. If liquid milk is not available, use dried buttermilk. The chicks must then be supplied with clean water at all times.

7. Clean the house two or three times during the first week, and twice weekly thereafter.

8. Clean litter and clean feed aid in preventing diseases.

9. Strong, healthy chicks are easy to raise, weak ones are not.

10. Often the mistake is made of closing the house too tight. See that the house is properly ventilated.

CIRCULAR NO. 157
(REVISED)

Brooding Chicks Artificially

J. E. HUMPHREY*

When 150 or more chicks are to be hatched at one time, a brooder stove and colony brooder house can be used economically. This number can be brooded under a brooder stove at no greater cost than brooding under hens. If the hens are not used to brood the chicks they will lay enough eggs to equal in value the fuel needed to operate a brooder. The labor involved in operating one brooder stove is no more than that necessary for the proper care of three or four hens with chicks. If early broilers and winter eggs are desired it is essential to hatch the chicks early. This means February-hatched chicks of the meat breeds, March-hatched chicks of the general-purpose breeds and April-hatched Leghorns.

KIND OF BROODER TO USE

The coal-burning brooder stove (see cut on title page) has proved very satisfactory wherever used. It is desirable because of its low cost per chick capacity, ample supply of heat, ease of regulation and lack of danger from fire. There are a number of coal burning brooder stoves on the market and altho some may have slight advantages over others all are constructed on the same general plan. Features to look for are the size of the coal chamber and the type of regulator. The larger the coal chamber and the more sensitive and reliable the regulator, the more satisfactory the stove will be. (The bar thermostat is more reliable than the wafer thermostat).

The Experiment Station has tried several oil-burning brooders but finds that it is impossible to get sufficient heat to keep the chicks warm when the weather is very cold.

This is especially true with February and March hatches where the outside temperature often gets below freezing. Good results have been secured with April and May hatches. The type of oil burner that uses no wick but burns the vaporized oil (air blast) has given very satisfactory results.

The capacity of brooders varies with the size of the stove. The most common sizes are the 42-inch canopy, usually advertised to accommodate 500 chicks, and the 48 and 52-inch canopy,

* Circular No. 157, by J. R. Smyth, has been revised and put into its present form by J. E. Humphrey.

to accommodate 1,000 chicks.* The 48 or 52-inch canopy is the most practical but never more than 350 chicks should be brooded under one stove.

THE COLONY BROODER HOUSE

The shed-roof colony brooder house has proved very satisfactory. The house shown in the plan on pages 8 and 9, is simple to construct, low in cost and can be moved easily with a

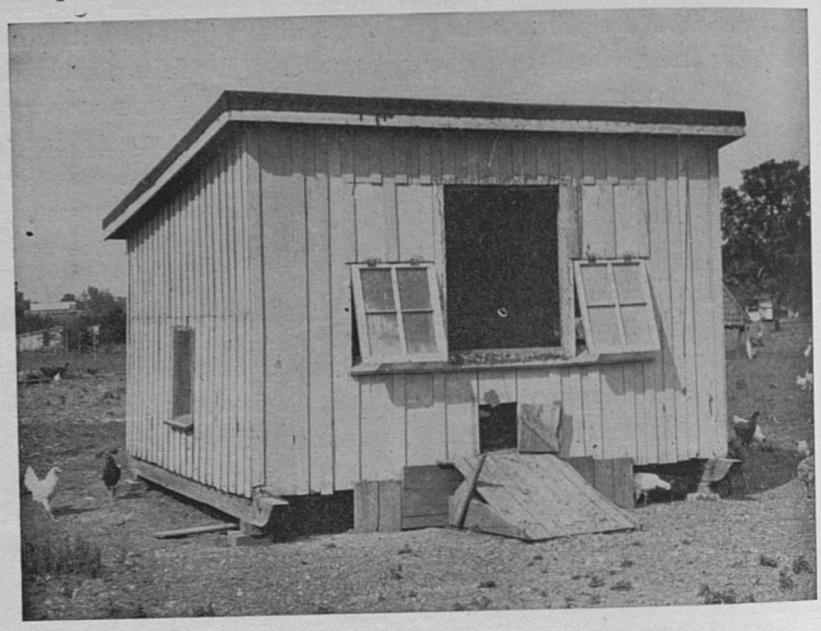


Fig. 1. A Colony Brooder House

team of horses. The chicks may be started near the residence and when they are old enough to do without heat the colony house may be moved to a wood-lot, orchard or cornfield where the growing chicks may have ample range. However, chicks should never be placed on land where chicks were brooded the preceding year. If the house cannot be moved, it is wise to use the four-yard system, allowing the chicks to run 10 days in each yard and then rotating. If chickens have been brooded on the same ground for several years in succession, such rotation is imperative in order to avoid heavy losses.

If the cockerels are sold for broilers or removed from the house there will be room to house the growing pullets during the

* Altho these brooders will accommodate this number the first week or two, the capacity is about half that number on the basis of raising to broiler age. Further information about the various types of brooders can be obtained from the Experiment Station.

summer. The colony house may also be used during the winter for surplus stock, such as cockerels, and in the spring, before the brooding season, for a breeding pen. Many poultrymen use the brooder house for laying hens during the winter, and in the spring they put these hens with the rest of the flock. It is readily seen that the colony brooder house need never lie idle, but is useful during the entire year.

It is not always necessary to build a special colony house for a brooder of this kind, as often a room of the poultry house or some other small house can be used. A house or room used for this purpose should contain 100 to 150 square feet of floor space to assure the best results.

CONSTRUCTION OF THE COLONY BROODER HOUSE

The colony brooder house should provide the following essential requirements: (1) ventilation, (2) sunlight, (3) dryness, (4) freedom from drafts, (5) durability, (6) soil sanitation. (See figure 1.)

The Floor. The floor should be made of shiplap or tongue-and-groove material with smooth surface. This aids in keeping the house clean and sanitary. The house should be set on 4 x 6 runners made so that a team can be hitched to them and the house moved to fresh ground each year. See plans on pages 8 and 9.

The Walls. The walls should be so constructed as to prevent drafts. If the walls have a smooth surface they can easily be kept free from mites and other vermin. However, boxing or rough lumber may be used if the cracks are stripped.

The Roof. Prepared paper roofing is the most satisfactory. It should be laid on a smooth, tight surface to prevent damage from wind or hail.

The Pipe Hole. The stovepipe hole should be cut several inches larger than the pipe to be used. A large piece of sheet metal, with a hole in the center just large enough to admit the pipe, should be fastened firmly on the roof. It will serve to hold the pipe securely and keep it far enough away from the wood to prevent fire. Special "roof saddles" to accommodate pipe of standard sizes may be purchased from most brooder manufacturers or poultry supply houses at nominal cost. These saddles are available for any pitch of roof, and are usually equipped with rain caps to prevent rain going down the pipe and rusting the stove.

The Muslin Curtain. The 4′ x 4′ double curtain in the center of the front of the house should be covered with unbleached muslin or sheeting. It should be kept closed at night and during cold, stormy days, especially while the chicks are young. It should be raised whenever the direct sunshine will strike the floor of the house.

BILL OF MATERIAL FOR BROODER HOUSE 10x10

Runners	2,	4″x6″x10′ —	40 bd. ft.
Joists	6,	2″x4″x10′ —	40 bd. ft.
Rafters	6,	2″x4″x12′ —	48 bd. ft.
Plates, etc.	3,	2″x4″x10′ —	20 bd. ft.
Window sills	1,	2″x6″x10′ —	10 bd. ft.
Nailing pieces	3,	2″x4″x12′ —	24 bd. ft.
Studding	3,	2″x4″x14′ —	28 bd. ft.
Studding	3,	2″x4″x12′ —	24 bd. ft.
			234 bd. ft.
Rough boxing, 1″x10″, No. 2			400 bd. ft.
Flooring, 1″x6″, matched, No. 2			130 bd. ft.
Battenings, ½″x3″			400 linear ft.
Roofing, 126 sq. ft., 2 ply			
Curtain frames, 8 pieces, 1″x4″x12″			32 bd. ft
2 pair sash, 6 light, 8″x10″			
8 pair of 2″ steel butt hinges		4 linear ft. 1″ mesh 4 ft. poultry	
1 pair of 6″ T hinges		netting (to cover curtained opening)	
6 pair of 1½″ hooks and eyes		1 piece unbleached muslin for	
15 lbs. of 8-penny nails.		curtain, 1⅛ yds. square.	
5 lbs. of 6-penny nails			
5 lbs. of 4-penny nails.			
5 lbs. of 16-penny nails.			

Some poultrymen prefer a 10′ x 12′ brooder house, which allows 20 more square feet of floor space at very little additional cost. Such a house may be easily pulled thru a 12-foot gate if the runners are 12 feet long and are placed the longest way. It should be 10 feet deep and 12 feet long. The plans on pages 8 and 9 may be used as a general guide. The front windows should be spaced equally between the double curtain and the ends. The following bill of material should be used:

BILL OF MATERIAL FOR BROODER HOUSE 10 FT. DEEP AND 12 FT. LONG

Runners	2,	4″x6″x12′ —	48 bd. ft.
Joists	7,	2″x4″x10′ —	47 bd. ft.
Rafter	7,	2″x4″x12′ —	56 bd. ft.
Plates, etc.	3,	2″x4″x12′ —	24 bd. ft.

Nailing pieces and headers	3,	2″x4″x12′ —	24 bd. ft.
Window sill	1,	2″x6″x12′ —	12 bd. ft.
Studding	3,	2″x4″x14′ —	28 bd. ft.
Studding	3,	2″x4″x12′ —	24 bd. ft.
			263 bd. ft.
Rough boxing, 1″x10″, No. 2			425 bd. ft.
Flooring, 1″x6″, Matched No. 2			150 bd. ft.
Battens, ½″x3″			436 linear ft.
Roofing, 144 sq. ft. of 3-ply			
Curtain frames, 8 pcs. 1°x4″x12″			32 bd. ft.
Two pair sash, 6 light, 8″x10″			
8 pair 2″ steel butts		4 linear ft. 1″ mesh 4 ft. poultry	
1 pair 6″ T hinges		netting (to cover curtained opening)	
6 pair 1½″ hooks and eyes		1 piece unbleached muslin for	
16 lbs. 8-penny nails		curtain 1⅛ yds. square.	
5 lbs. 6-penny nails			
5 lbs. 4-penny nails			
5 lbs. 16-penny nails			

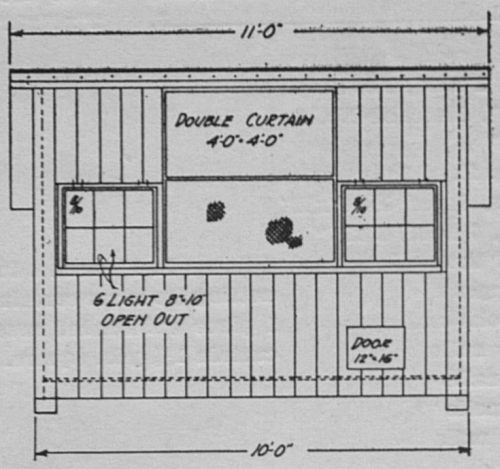
OPERATION OF THE BROODER

Fuel. Most of the coal-burning brooder stoves are constructed to burn anthracite (hard coal) which gives very satisfactory results. This coal burns slowly, throwing off an abundance of heat, and makes very little smoke or soot. It will hold fire thruout the night and brooders heated with it are easy to regulate. Where anthracite is not carried in stock, the poultry raisers may club together and make up a sufficient order to justify the local coal dealer ordering a carload.

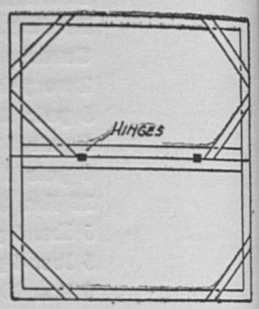
Many poultry raisers have used soft coal in their brooders, but this is never so satisfactory as anthracite. If soft coal is used, the stove requires more care and attention. Do not use fine coal or large lumps. Lumps from 2 to 3 inches in diameter, commonly called coarse egg coal, give the best results. It will be necessary to remove the pipe every week or ten days to give it a thoro cleaning. All parts of the stove should be watched carefully to see that they do not become clogged with soot. When using soft coal it is advisable to replace the customary 3-inch pipe with a large one. This may be done by using an expansion joint running from 3″ to 5″ at the stove. Some manufacturers furnish these larger pipes and the expansion joint. Most of the new stoves have the 5″ or 6″ stovepipes.

Coke is sometimes used and gives excellent heat but will not hold fire overnight. This makes it advisable to have some hard coal to use at night.* A mixture of half coke and half hard

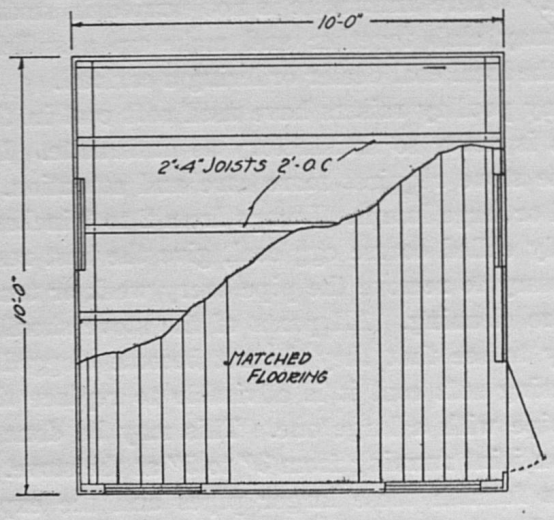
*A mixture of soft coal and coke is fairly satisfactory.



FRONT ELEVATION
Scale ½"·1'-0"

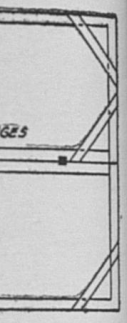


DETAIL OF CURTAIN

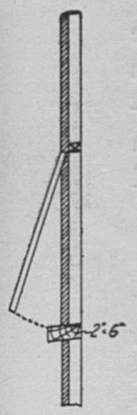


GROUND PLAN
Scale-½"·1'-0"

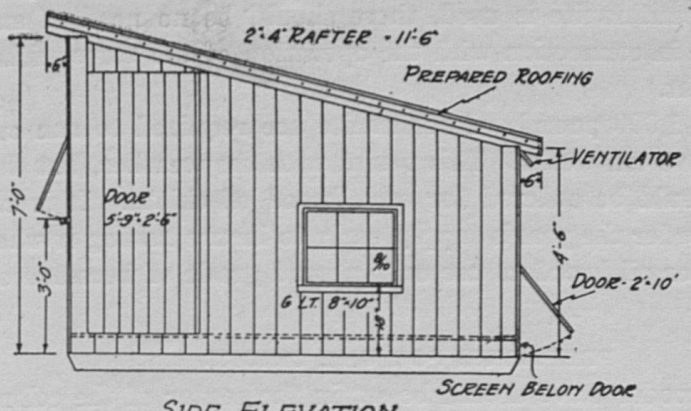
DETAIL



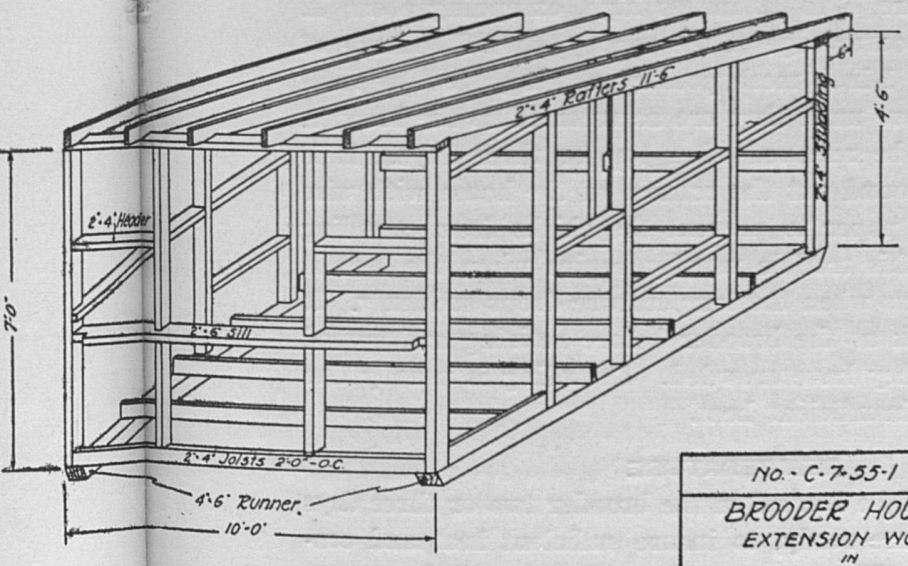
CURTAIN



DETAIL OF WINDOW



SIDE ELEVATION
Scale ½"-1'-0"



DETAIL OF FRAMING

No. - C-7-55-1

BROODER HOUSE
EXTENSION WORK
IN
AGRICULTURAL ENGINEERING
COLLEGE OF AGRICULTURE, UNIVERSITY OF KY

coal will prove fairly satisfactory for holding fire overnight if the supply of hard coal is running short.

The fire in the stove should be shaken down well and the stove filled with coal each morning and evening. If a good quality of anthracite is used, there should be no need of any more labor in connection with the operation of the stove, either day or night.

About 1,000 pounds of anthracite are required to run one brooder stove ten weeks. This varies with the weather, but this amount should be ordered for each brood of chicks. It is advisable to order the year's supply early to insure having it when needed. For oil brooders use only a good grade of kerosene oil or fuel-oil.

PREPARING FOR THE CHICKS

The brooder stove should be set in the center of the colony brooder house, with the pipe extending out thru the roof.* A thin layer of about one-half to one inch of sand may be put on the floor around the stove and should extend out at least 12 inches beyond the outer edge of the canopy. This should be covered with a thin layer of finely cut litter. Straw, alfalfa leaves or any litter that is clean and not musty is suitable for this purpose. Never use sawdust because the chicks may eat it. A circular enclosure, 8 to 12 inches high, extending about 12 inches beyond the outer edge of the canopy, should be made of hardware cloth or 1-inch mesh poultry netting, to keep the chicks near the stove until they are accustomed to the brooder. This netting may be removed after two or three days. It is also advisable to round out the corners of the house with wire netting or roofing paper to prevent the chicks from crowding in the corners. This trouble usually begins when the heat is reduced or on nights when the temperature drops suddenly. It is advisable to look at the brooder before retiring and spread the chicks out if they have crowded. Crowding is usually due to floor drafts or insufficient heat.

TEMPERATURE

The fire should be started in the brooder two or three days before the chicks are ready, to insure sufficient heat and constant temperature. The temperature at the edge of the canopy an inch off the floor should be about 95° F at the start and

*See instructions about pipe hole on page 5.

should be decreased about five degrees per week, until the chicks are large enough to do without artificial heat. The temperature in the brooder room should be such that the chicks will be comfortable in any part of the room, but warm enough to settle

Fig. 2. Chick range. More shade is needed. Note self-feeders and artificial shade.

down only at the edge of the canopy. The behavior of the chicks is the best guide as to the heat requirement. If they crowd under the canopy and chirp as if they are cold, more heat is needed. If they crowd away from the stove the temperature probably is too high. During the day the chicks should be comfortable in any part of the brooder house and at night remain in a circle around the outer edge of the canopy.

PUTTING CHICKS INTO THE BROODER

Do not put the chicks into the brooder unless feed is ready. If they must be taken from the incubator they may be kept in chick boxes. If baby chicks are purchased they should be left in the shipping boxes until they are to be fed. They should be at least 24 hours old before they are put into the brooder and fed. It is more satisfactory to put the chicks into the brooder in the morning for then they may be watched carefully during the first day.

WEANING CHICKS FROM THE HEAT

There is great danger of the chicks crowding in the corners and being suffocated when the source of heat is removed.

It is advisable to put very low roosts into the house as early as the third week. These can be put across the back of the house and laid on bricks. Lay the bricks flat at first and gradually raise the roosts until they are about 1½ feet high. It is also a good plan to put some of the chicks on the roost each night until they have become accustomed to roosting. The heat should never be stopped abruptly, but should be decreased gradually until it is discontinued. Do not remove the brooder stove from the house until the chicks have become accustomed to roosting. Chicks should never be moved from the brooder house until they have learned to roost.

FEEDING CHICKS

To insure normal growth the chick ration should include protein, carbohydrates, fats, minerals, vitamins and water, in sufficient amounts and in the proper proportions.

The most satisfactory sources of protein are milk, meat scrap and fish scrap. There are also vegetable sources but these have proved satisfactory for poultry feeding only when supplemented by mineral mixtures.

The fat and carbohydrates are furnished largely by the grains used. Usually all rations contain a sufficient quantity of grain and grain products, which are very essential to supply heat and energy.

Minerals are necessary for the proper development of bone. The chief mineral elements needed are calcium and phosphorous. Both are found in meat scrap, fish scrap, bone meal and milk. Oyster shell and ground limestone carry only calcium.

Vitamins are very essential to proper growth. Investigations have shown that when vitamins are not present in the ration, certain nutritional troubles will develop. In chick feeding only vitamins A, B and D, need to be considered.

When vitamin A is not present in the ration, nutritional roup will develop. This is very similar in appearance to common roup. The chief practical sources of this vitamin are yellow corn and green feed. It is found in liberal amounts in cod liver oil and egg yolks. Cod liver oil, on exposure to air, soon loses its vitamin A potency.

When vitamin B is not present a trouble known as polyneuritis (nerve disorder) will develop. This trouble is characterized by a loss of muscular control. Vitamin B is also nec-

essary for proper growth. It is found in all whole grains and in liberal amounts in middlings. Practically all chick rations contain sufficient vitamin B.

When vitamin D is not present, rickets develops. This is often called leg weakness and is not a disease but a symptom of a nutritional deficiency. It is caused by the failure of the chick to properly use the minerals in the development of bone. Sunlight, coming in contact with the chicks and not filtered thru glass, supplies this vitamin factor and enables the chicks to develop bone properly. Let the chicks out in the sunshine. If it is impossible to get the chicks out into the sunlight, vitamin D should be supplied by egg yolks or cod liver oil. Eggs should be cooked for twenty minutes in order to eliminate any danger of transmitting bacillary white diarrhea by infected eggs. Only eggs from one's own flock or from tested flocks should be used. Cod liver oil, if used, should be added to the mash at the rate of 1 percent. This amount would be 1 pint to each 100 pounds of mash. In order to thoroly mix the oil in the mash one pound should be mixed with a small quantity (10 lbs.) of mash and then this amount mixed with the remainder of the mash.

CHICK RATIONS AND FEEDING METHODS

Most of the chick feeding practices can be grouped under the following methods: (1) Grain and milk the first week, supplementing this with mash after the chicks are a week old, (2) mash and milk the first week with the addition of grain, beginning the second week, and (3) the "all-mash" method. Regardless of the method used the ration should provide the essential requirements already discussed.

THE RATIONS

Mash No. 1	Lbs.
Bran	25
Shorts	25
Ground yellow corn	25
Meat scrap or fish scrap	10
Dried buttermilk	10
Bone meal	5
Salt	1

Grain No. 1	Lbs.
Cracked yellow corn	50
Cracked wheat	50

Mash No. 2	Lbs.
Bran	30
Shorts	30
Yellow corn meal or ground yellow corn	20
Meat scrap or fish scrap*	20
Salt	1

Grain No. 2	Lbs.
Cracked yellow corn	35
Wheat	35
Plump oats	30

* A high grade of 60% protein tankage may be used after chicks are frying size.

Mash No. 1 is the best to use when a large number of chicks are brooded and when no liquid milk is available. If milk is not used, clean, fresh water should be supplied at all times. If liquid milk is available, the dried buttermilk should be omitted from this mash.

Mash No. 2 is a growing mash and should be used for maturing the pullets from about the twelfth week until ready to lay.

A SCHEDULE FOR CHICK FEEDING

First Week. The first feed should consist of sour skim milk or buttermilk and chick-size grain. A grain mixture made of equal parts by weight of finely cracked corn and cracked wheat, or a commercial chick grain of good quality may be used. The grain mixture should be fed five times each day, feeding each time only the amount that the chicks will clean up in ten to fifteen minutes. Keep the milk before the chicks at all times.

Second Week. Continue feeding milk and the same grain mixture. Feed grain only three times each day (morning, noon and night), the amount the chicks will clean up in twenty to thirty minutes. Start feeding a dry mash. Mash mixture No. 1, without dried buttermilk, may be used. If no milk is available, mash No. 1 should be used from the start. In this event keep water before the chicks continuously.

The mash may be fed at first on clean pasteboard box lids, in small pans or in shallow wooden boxes, three or four times each day and then only the amount that the chicks will clean up in thirty minutes. Continue to give them all the milk or water they will drink. If milk is available for the chicks at all times a commercial starting mash, which carries ample protein, should not be fed as digestive disorders will result from over-feeding of protein.

Third to Twelfth Week. Continue the grain as above, changing to a coarser grain mixture about the seventh week. By the twelfth week the chicks will be able to eat the same grain that is fed to laying hens, except that it is best to crush or crack the corn. Keep the *mash before them at all times* in a self-feeder or hopper. Continue to give them all the milk they will drink.

Twelfth Week to Maturity. The cockerels should be separated from the pullets and those that are not wanted for breeders should be sold as broilers. Feed the pullets the same ration that is recommended for the laying flock (see mash No. 2). If

milk is available, give one gallon per day to each forty pullets and reduce the tankage or meat scrap in the mash to 5 lbs. Grit, charcoal, oyster shell or ground limestone, and mash should be kept before them at all times in the self-feeder and grain (see grain No. 2) should be fed twice daily. The amount of grain to feed will depend upon the age and development of the pullets. If it is desirable to retard the growth of the pullets, feed more grain. If the pullets are late and need to be pushed, feed less grain but never more than they are consuming of mash.

COMMERCIAL CHICK FEEDS

Feed one of the well-recognized commercial chick starters the first few weeks if it is impossible to obtain the materials required in making the home mixtures. *If a commercial starter is used do not feed milk but use water instead, since the commercial feeds contain sufficient protein.* Baby chicks eat very little during the first few weeks, consequently, it is necessary that their ration be well balanced with the essential ingredients required for proper growth.

THE ALL-MASH METHOD

A number of experiment stations have worked out rations which have proved satisfactory and which do not require the grain to be fed separately. This method differs from the general practice of grain and mash feeding, in that the all-mash ration contains the same ingredients and they are all ground and mixed together. This method of feeding provides the chicks with the right proportion of grain and mash. The following all-mash ration is recommended for those who desire to use this method.

Mash No. 3

Ground yellow corn	70 lbs.
Wheat middlings*	25 lbs.
Raw bone meal	5 lbs.
Salt	1 lb.

In addition to this mash the chicks should be given *all the milk* they will drink. If sour skimmilk or buttermilk is not available add 25 pounds of dried buttermilk to the mash mixture, or use one of the rations given below. This ration contains all the requirements for growth and development, except vitamin D, which can best be supplied by getting the chicks out

* A good grade of mixed wheat feed or shipstuff may be used in place of middlings.

into the sunshine. If the chicks do not get out into the sunshine it will be necessary to add cod liver oil or egg yolks to the ration. If yellow corn is not used, green feed should be supplied as a source of vitamin A. A growing crop, such as green rye or wheat, will prove satisfactory as a source of green feed, if a good alfalfa clover, or grass pasture is not available.

In case liquid milk is not available and it is desired to feed an all-mash ration, either of the following formulas will do. Mash No. 4 is higher in protein and preferable for chicks raised in confinement. Mash No. 5 is to be recommended when the chicks have a good yard range during the brooding period.

Mash No. 4	
Corn feed meal	43 lbs.
Coarse bran	15 lbs.
Middlings	15 lbs.
Meat scrap	15 lbs.
Dried buttermilk	6 lbs.
Alfalfa leaf meal	3 lbs.
Steamed bone meal	2 lbs.
Salt	1 lb.
Cod liver oil*	1 lb.

Mash No. 5	
Ground yellow corn	50 lbs.
Middlings	20 lbs.
Bran	10 lbs.
Dried buttermilk	8 lbs.
Alfalfa leaf meal	5 lbs.
Meat scrap	3 lbs.
Steamed bone meal	2 lbs.
Salt	1 lb.
Cod liver oil*	1 lb.

When using the all-mash method, be sure to allow sufficient feeder space. A feeder 24 inches long (both sides accessible) should be supplied for each 40 chicks. See that the feeders contain mash at all times, for if one becomes empty the chicks will crowd and may cause smothering.

If after the chicks are ten weeks old or older it is desirable to retard too rapid development, it is advisable to feed some crushed or cracked corn. The amount to feed varies with the age and development of the chicks, but should never be more than equal the amount of mash consumed.

The all-mash may be fed thruout the growing period with good results. However, most poultrymen in this State feed the all-mash up to broiler age and then change to mash and grain. Make the change in the ration before the pullets start laying rather than afterwards. The fewer changes made after the pullets are laying the better will be the results, as changes in the ration tend to disturb production. For further information on feeding for egg production, see Extension Circular No. 186 of the College of Agriculture.

* Do not add cod liver oil if chicks get out into direct sunshine.