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UNIVERSITY OF IDAHO

COLLEGE OF AGRICULTURE

EXTENSION DIVISION

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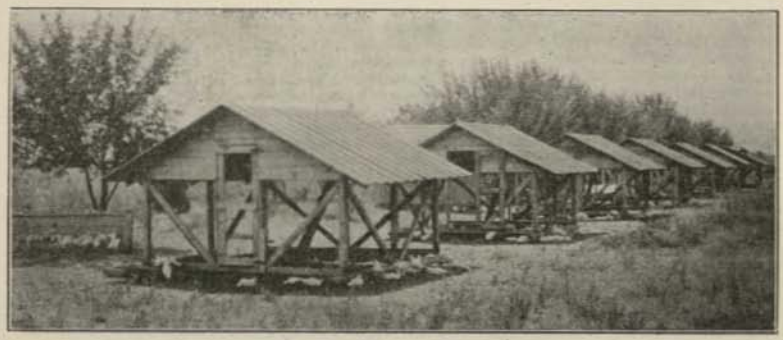
BROODING AND PULLET DEVELOPMENT



COOPERATIVE EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS OF THE STATE OF IDAHO UNIVERSITY OF IDAHO EXTENSION DIVISION AND U. S. DEPARTMENT OF AGRICULTURE COOPERATING.

POULTRY SECTION

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SUMMARY

The measure of a poultryman's success is his ability to produce good pullets.

The brooder should be in order and well heated before the chicks are received.

Liquid milk is the best first drink and feed for baby chicks. Drink for chicks should be warmed to prevent chilling.

Wet or sloppy feed should not be fed to chicks. It is likely to cause digestive disturbances.

Yellow corn has the greatest feeding value of any of the grain feeds for growing poultry.

Get the chicks on a green pasture if possible. Alfalfa or clover is best.

Separate cockerels from pullets as early as it is possible to determine the sex. By so doing congestion and over crowding will be relieved.

Get pullets on the range early. A meadow by the side of a cornfield is an ideal summer range. Fall wheat and sweet clover seeded together in the spring makes a good summer range for northern Idaho.

Keep the pullets growing from the time they are hatched until they are grown.

Poultrymen must learn to be good feeders. Anticipate the needs of fowls and feed accordingly.

A practice that has proven successful should not be discarded until a better one is known.

*BROODING AND PULLET DEVELOPMENT

By

Pren Moore, C. E. Lampman, Frank E. Moore,
and John Scholten.

BRINGING pullets to maturity in a state of development which will make maximum egg production possible involves the greatest problem of the poultry industry. A well developed pullet is one which has strong, regularly formed bones, large digestive capacity, an abundance of yellow pigment, is well fleshed, and is free from disease.

The best feeding will not make pullets yield profit if they have not been well grown. In order that the most satisfactory results may be obtained, it is imporant to understand the factors involved. The most important are: (1) Breeding, (2) Condition of Breeding Stock, (3) Brooding, (4) Range, (5) Feeding, (6) Sanitation, (7) Disease, (8) Nutrition. Each factor has an influence in the development of chicks which determines the extent to which mature stock may or may not be profitable. The problems of feeding for winter egg production are fewer with pullets that have been well grown than with weak and poorly developed ones. Well developed pullets feed better and thus take on flesh more rapidly. They are less susceptible to colds, roup, and other diseases. Egg production is not a difficult problem with pullets that are well developed.

This circular deals primarily with the problems involved in raising good pullets. However, selection and physical condition of breeding stock are limiting factors which determine to a marked extent the possibility of developing chicks into useful stock. Immature and physically weak stock should not be used for breeding purposes. Stock from which eggs are to be used for hatching should have a long rest period and be well fleshed in advance of the breeding season.

Brooding

In brooding, regardless of the system used, the aim is to provide a uniform, dependable temperature, with heat

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enough for comfort, and floor area sufficient to allow each chick to select its own degree of comfort. Too much heat will devitalize the chicks.

It is necessary to teach chicks the source of heat. This is just as necessary with battery started chicks as with day-old chicks and may be accomplished by the use of the floor guards illustrated in this bulletin.

Furnace System of Brooding

This system has been developed in the field by the extension poultry specialist with the view of accommodating large numbers of chicks in single units. Superior features claimed by users are that the building is inexpensive, the heating unit is simple and cheap to construct, the heating cost is low, the heat is dependable and provides a uniform temperature when operated according to instructions.

Either coal or wood may be used as fuel but wood appears to be the more satisfactory. Apple tree roots, slab wood or any inferior wood may be used. When starting the fire, place a piece of burlap that has been saturated with kerosene in the cleanout at the base of the chimney, place a similar piece in the furnace and light both as nearly at the same time as possible. This will warm the chimney quickly and develop a satisfactory draft. About three days are required to heat the floor properly. When once the floor is heated the cooling process is very slow. The floor should be covered with clean sand to a depth of about four inches. Dirt floors become very dusty. If clean sand is not available, floors should be made of concrete. Litter is not used on sand floors.

The house may be built either portable or permanent. If portable, it should not be over 14 feet deep and should be on skids and have the furnace removable. It should be moved in the fall and the new sand put in place so that it will be thoroughly dry before needed. Where it is necessary to use slightly damp sand, windrow it above the furnace flue, open up the house, and build a fire in the furnace. This will tend to drive off the moisture. It is useless to use heat to drive off excess moisture unless the house is open to allow it to escape.

At the location selected for the brooder house, dig the hole for the furnace and the trench for the flue. The hole for the furnace should be 24 by 38 inches and 28 inches deep.

The trench for the flue is 16 inches deep at the furnace

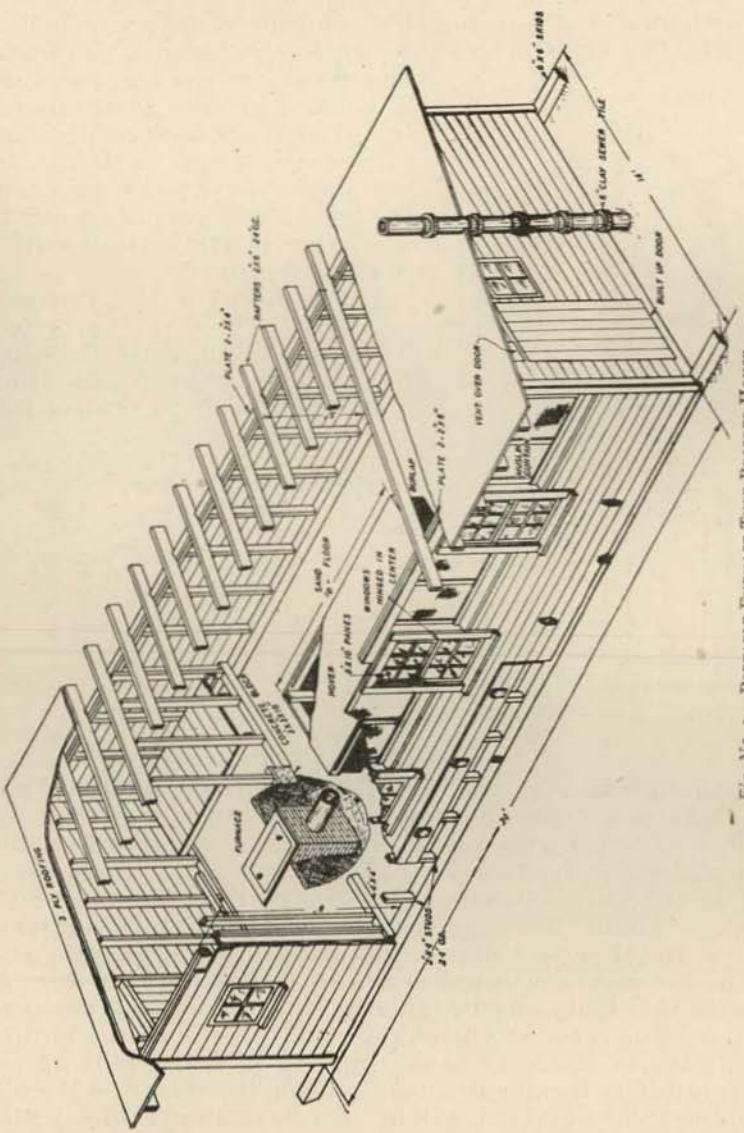
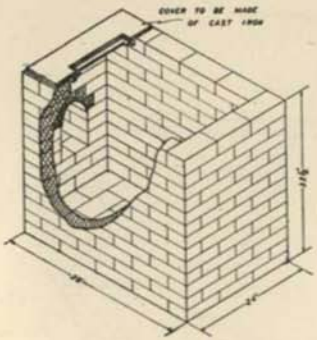


Fig. No. 2. Portable Furnace Type Brooder House.

end and 10 inches deep at the other end of the building. The furnace is built of common brick without mortar. The bottom is 2½ inches thick and the walls are 4 inches thick. The walls are carried up to the level of the floor and earth or sand is carefully banked around them above the ground surface to prevent the escape of sparks. If this is not done the cracks between the bricks will permit so much draft that it will be impossible to control properly.



The bottom of the furnace inside will be 30 inches below the level of the sand floor in the brooder room. A cast iron plate* with a draft control for

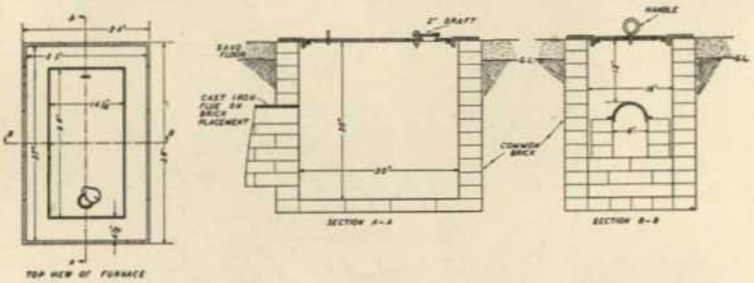


Fig. No. 3. Furnace Detail Drawing.

regulating the fire fits over the top of the furnace and completes it. The flue under the brooder room may be made of 8-inch clay sewer or drain tile, as shown in the plans, or 8-inch square flue lining, or brick. A single row of bricks laid crosswise make the bottom and top. The sides should be 4 inches thick and three bricks high. In this way a flue is built about 8 inches square inside. No mortar is used either in the furnace or flue in order that both may be taken up and relaid in a new location if necessary. The chimney at the end of the building may be made of sewer pipe or of brick laid up in mortar. The former is much quicker to erect and if cull pipes can be obtained, will be very economical. The depth of trench here given is correct for the 8-inch sewer pipe

* Cast iron arch, furnace cover and clean-out doors for flue may be secured from the Weiser Iron Works, Weiser, Idaho.

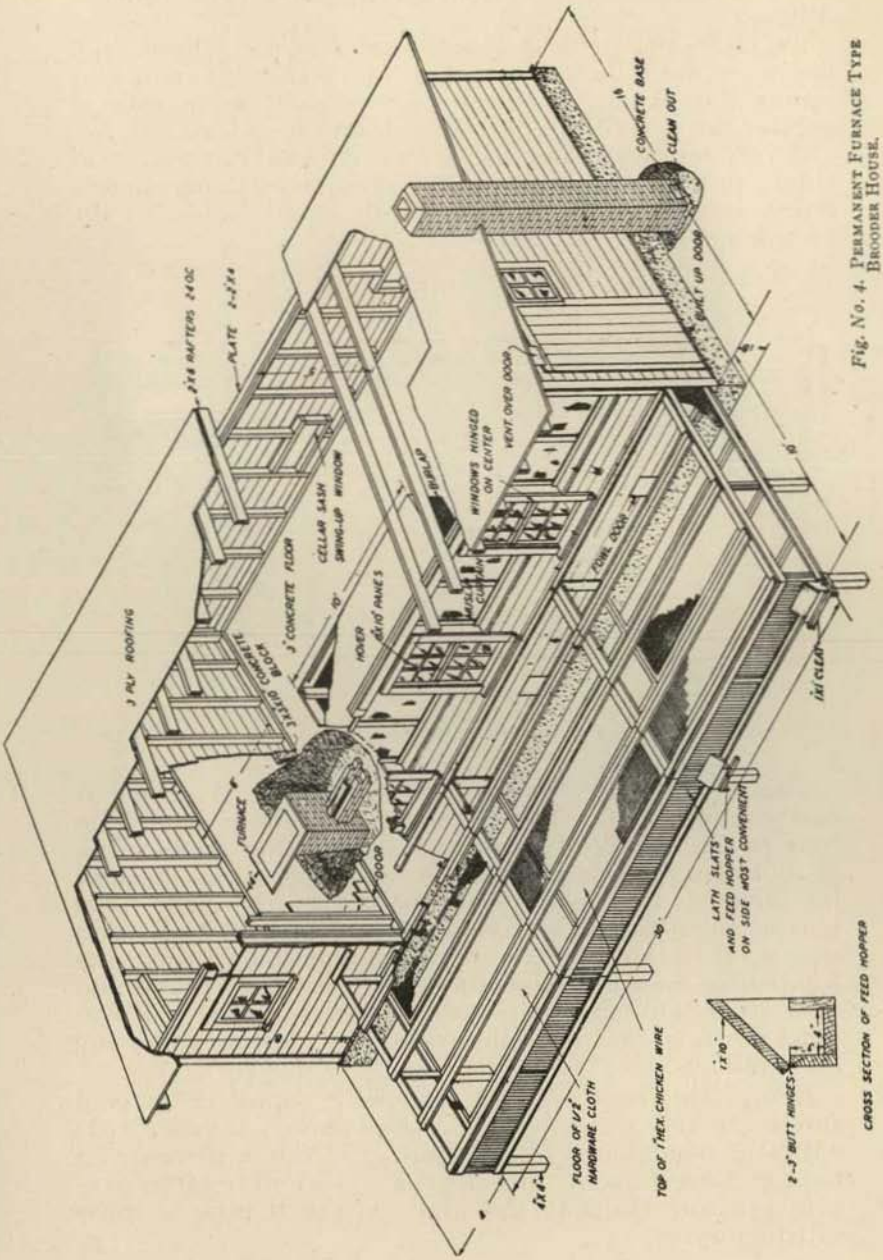


Fig. No. 4. Permanent Furnace Type Brooder House.

or flue lining. If brick is used the trench will be 3 inches deeper.

To clean the furnace type brooder house where sand floors are used, the top one-fourth inch of sand should be removed daily or at least twice a week with a fine rake or similar device. Clean, dry sand should be added.

A concrete floor and the screen floored sun yards, as shown in this bulletin, should be provided if a permanent house it built. Sixteen foot depth is advisable in the permanent house.

COLONY HOUSE SYSTEM OF BROODING

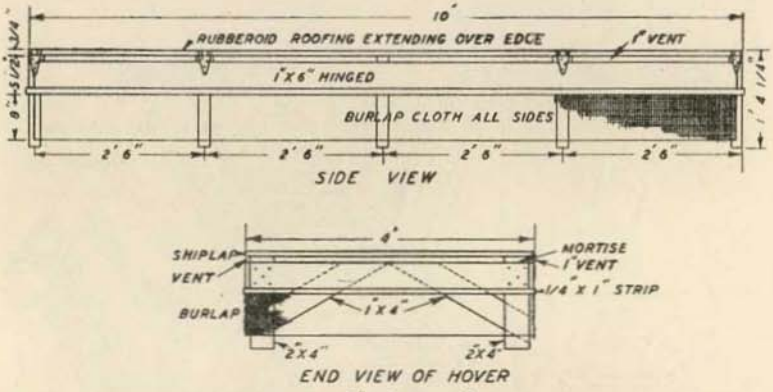


Fig. No. 5. FURNACE TYPE HOVER.

This is a smaller house with wooden floor which is easily moved to new locations. It will accommodate from four to five hundred chicks while they are small. The 14-foot depth provides ample sleeping space around the hover as well as sufficient feeding space in the front part of the house. The style of front illustrated allows a simple means for adequate ventilation without floor drafts by opening the windows at the top. It permits a maximum amount of sunlight on the floor by dropping the top windows down, or on warm, sunny days by entirely removing the windows.

Heat: The heat is most generally supplied by coal stoves. In this state types of stoves should be used that will be dependable in burning soft coal. Such stoves need to be of large capacity and provide sufficient draft to prevent creosote clogging the pipe. A 5-inch pipe is most satisfactory.

Hovering the Chicks: Use the adjustable floor guard; first, to confine the chicks to the heated area until hover-broken; and second, to produce a more even distribution of chicks around the hover by providing a space free from floor drafts in front of the hover.

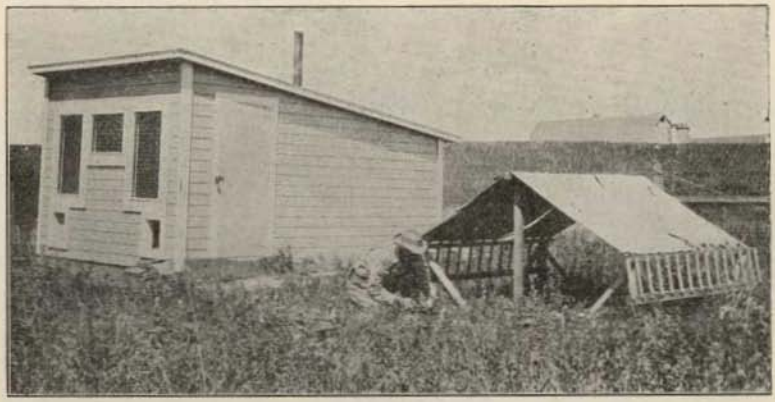


Fig. No. 6. View of Portable Colony Brooder House.

A proper brooding condition is one in which the chicks will settle down and give evidence of being comfortable. Insufficient heat will cause chicks to crowd toward the source of heat while excessive heat will cause them to crowd away.

The behavior of chicks which denotes comfort or lack of comfort is a more dependable guide to correct temperatures than a thermometer.

For the furnace type brooder house heat a strip of floor about 10 inches wide through the length of the house until it feels quite warm to the hand, yet not hot. Place the hovers over the warm surface and cover the floor with a layer of clean sand. Use straw on concrete floors. The air in the room should be fairly cool.

Utmost precautions must be used in handling chicks to prevent chilling. Chicks that have been chilled are difficult to raise. If the chicks are hatched on the farm where they are to be brooded, move them from the incubator to the brooder in lined containers . A clothes basket lined with a blanket is good. When the basket is filled and ready to move, the blanket may be folded over the chicks. Chicks that have come from a distance must be covered while enroute from the railroad station to the brooder house,

and after they are placed in the brooder house they should be confined near the hover for a few hours.

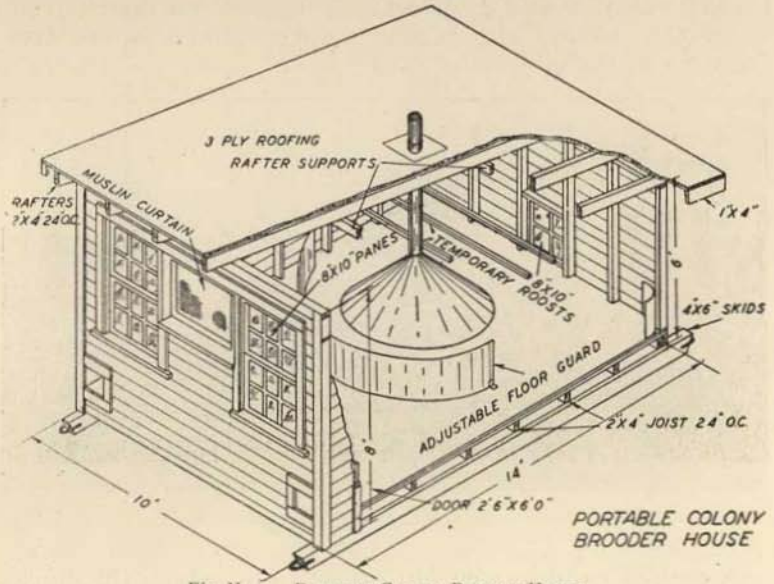


Fig. No. 7. Portable Colony Brooder House.

Feeding

The fact that chicks have a portion of the unabsorbed yolk as a reserve of food when hatched is the reason they do not require feed immediately after hatching. It is apparent that chicks require a drink in some form before solid feed. It may be just as detrimental to withhold feed too long as to feed too soon. In general, chicks need drink after they are 24 hours old and need small quantities of feed soon after they are 48 hours old. The danger of overfeeding newly hatched chicks depends on the type of feed used. There is more danger from the use of grains than from mash mixtures. Chicks shipped any distance from hatcheries should have warmed water or milk and some feed as soon as they have arrived at their destination. The practice at the Experiment Station has been to take chicks from the incubator on the 21st day and hold them over night in chick boxes. They are placed in the brooder house the following day and given free access to liquid milk and chick sized oyster shell. The milk is fed in fountains and the oyster shell is placed on cardboards. A light feed of mash, on cardboards, is given in the afternoon of the same day.

The extent to which the first feeds are given should be governed by the action of the chicks. Feed as soon as they act hungry. Do not wait until they are excessively hungry for then the danger of gorging and overfeeding is increased.

Basic Requirements of Chick Feeding

1. Vitamin Supplements.
2. Mineral Supplements.
3. Animal Protein.
4. Minimum Fibre.

The vitamin and mineral requirements need especial emphasis with early hatched chicks or with chicks reared in confinement.

In making up a ration for early hatched chicks started in confinement, it is obviously necessary to incorporate those fundamental supplementary feeds such as vitamins and minerals which the chicks would naturally get if they were hatched in June and were running out-of-doors on green grass and in direct sunshine. In other words, the rations used early must be more complete from the standpoint of accessory food factors, such as vitamins and minerals, than the rations used later in the season.

Vitamin A: Feeds rich in vitamin A are yellow corn, well-cured alfalfa or clover leaves and blossoms, and all green growing feeds.

Chicks fed on a ration deficient in vitamin A show a paleness or lack of yellow color throughout the body, especially in the beak and shanks. Extreme cases will show swelling about the head and watery eyes and nostrils, a condition known as *opthalmia*, but more often called nutritional roup by poultrymen.

Rations used with excellent results for early hatched chicks at the Experiment Station the past two years have contained 60 per cent ground yellow corn and 5 per cent high grade alfalfa leaf and blossom meal as a safeguard against a vitamin A deficiency. Beneficial effects have been observed from feeding additional well-cured alfalfa leaves in racks until the chicks can get on growing green grass. In Idaho the amount of yellow corn that can be included in the ration as a source of vitamin A may be influenced necessarily by price, but in any event the greatest amount possible should be used in any formula.

The results at the Idaho Experiment Station, at other experiment stations and in the field appear to justify the recommendation that the greatest possible amount of yellow corn be fed.

Vitamin D and Mineral Requirements: The vitamin D and mineral requirements (calcium and phosphorus) are closely linked in that the calcium requirements of growing chicks are very high and the vitamin D requirement in the ration is necessary for efficient calcium metabolism, or utilization in the body. A deficiency in either the calcium supplements or the vitamin D factor causes a lack of calcium assimilation which in turn produces rickets in chicks, more commonly known as leg weakness. Calcium requirements may be deficient to the extent of interfering with proper growth and bone development producing a condition of general unthriftiness without leg weakness occurring until a more advanced condition of malnutrition is reached. This phase of the ration needs special emphasis when growing early hatched chicks or when growing chicks under any condition of confinement that does not allow them access to direct sunshine. The ultra-violet rays of direct sunlight produce the same anti-richitic effect as vitamin "D" in the ration. Either access to direct sunlight or the vitamin "D" supplement is necessary to promote proper calcium assimilation and normal bone development. The common source of vitamin D is cod liver oil. It has become a practice to incorporate cod liver oil to the extent of 2 per cent of the ration for chicks until they are out-of-doors in direct sunshine a great amount of time. Cod liver oil may be added either to the mash or to scratch mixtures; and if used in the mash, can be most readily mixed by using one quart (2 lbs.) of oil to 10 or 15 pounds of bran. After being thoroughly mixed with the bran it is easily mixed with the rest of the ration.

The mineral requirements (calcium and phosphorus) appear to be adequately supplied by incorporating in the ration from 4 to 5 per cent each of chick sized oyster shell and chick sized granulated bone meal. Two grades of bone meal are available as poultry feeds; the grade called by manufacturers "raw", meaning a bone meal which has not had the protein extracted and which analyzes about 25 per cent protein; and the grade called "steamed" or "sterilized", meaning a bone meal from which the protein has been largely removed. Such grades rarely analyze more than 6 per cent protein. The feeding work at the Experiment Station has resulted in a preference for the "raw" bone meal. The chick size or granulated bone meal is preferred to the pulverized bone flour.

Although some poultrymen have adopted the practice of substituting limestone grit or calcite rock for oyster

shell, preference should be given to the use of oyster shell and in no case should a substitute be used unless it has a guaranteed analysis of 98 per cent calcium carbonate.

Animal Protein: Liquid milk furnishes the animal protein that is most efficiently utilized by chicks. If liquid milk is available, it should be the chicks' first feed. For many poultrymen the safest way to feed milk is to feed it sour. However, if milk is being separated at the farm, it may be fed fresh each morning. Milk founts should be cleaned thoroughly every morning. Care should be taken to prevent accumulation of mold in the tops. During extremely hot weather it is best not to feed either sweet or sour milk in quantities greater than will be consumed in two hours. At the Experiment Station, when no animal protein is included in the mash, milk is the only drink given for the first two weeks; after which both milk and water are given.

Fountains should be of such type as to allow chicks to drink but keep them out of the milk. New galvanized iron should not be used for milk. Tin, enamel ware, or crockery vessels are preferred. The zinc surface coating on new galvanized iron is attacked by the lactic acid of milk resulting in a compound which is poisonous to chicks. If new galvanized utensils are to be used, sour milk should be allowed to stand in them two or three days until the inside surface takes on a darkened coloration. Then after a thorough cleansing, they may be safely used.

When liquid milk is not available, powdered milk should be incorporated to such an extent as the price justifies. Dried buttermilk is by far the most readily obtained in Idaho.

It is apparent that the proteins of powdered milk are more efficiently utilized by the chicks than are the proteins of any of the meat or fish meals. Very satisfactory results in growth are secured by a combination of powdered milk, high grade meat scraps, and fish meal. After the chicks are past 4 or 6 weeks of age they apparently utilize more efficiently the proteins of meat scraps and fish meal. Because of the price, it may be desirable to decrease the proportions of powdered milk after this age.

Fibre: The digestive tract of young chicks is such that any great quantities of fibrous feeds in the ration cannot be utilized satisfactorily; consequently large proportions of such feeds as oats or barley, either whole or ground, should be avoided. When alfalfa is incorporated in the ration as a source of vitamin A, the leaf meal rather than the whole

hay ground fine is preferred. When alfalfa chaff only is given, the green leaves free from must or mold should be used. The stems of the alfalfa plant are high in fibre and contain very little protein or vitamin A and are therefore detrimental rather than beneficial.

Rations

It is recognized that many combinations of the more suitable grains may give satisfactory results when the basic requirements of the rations, such as vitamins and minerals, are present in adequate proportions. It is important, however, to keep in mind that the rations for early hatched chicks started in confinement must necessarily be more complete in these basic requirements than is the case in rations for late hatched chicks started out of doors.

A ration that has been used successfully at the Experiment Station for the past two years and in which these basic requirements have been incorporated is as follows:

Mash

Ground Yellow Corn	60 lbs.
Bran (Flaky)	15 lbs.
Shorts (or ground wheat)	10 lbs.
Alfalfa Leaf Meal	5 lbs.
Chick Size Bone Meal	4 lbs.
Chick Size Oyster Shell	4 lbs.
Cod Liver Oil	2 lbs.
Salt	1 lb.

Milk alone is usd as a drink for the first two weeks, after which both milk and water are given.

The above mash mixture may be fed as an all-mash ration until the chicks are large enough to eat whole wheat. Then it may be supplemented with a scratch mixture consisting of:

Cracked Yellow Corn Whole Wheat	Equal Parts

Many poultrymen prefer to feed a combination of mash and scratch from the start. A very good scratch mixture to use while baby chicks are small is as follows:

Cracked Yellow Corn	50 lbs.
Pin Head Oats	25 lbs.
Cracked Wheat	25 lbs.

Mash mixtures should be neither too fine nor too coarse. A gritty, granular texture is desired in the corn used in the above mixture. The amount of bran used tends to give the ration the desired flakiness. Fine meals are to be avoided.

During the past season, in addition to the above ration, well-cured alfalfa leaves have been kept available in self-feeding racks until the chicks could get out of doors onto fresh-growing green feed.

In localities where corn is extremely scarce or high in price, the above ration may be modified to the extent of replacing one-third of the corn with ground wheat, provided additional quantities of well-cured green alfalfa or clover leaves are kept available to supply sufficient vitamin A.

Where liquid skimmilk is not available, it is recommended that to each 100 pounds of the above mash the following be added:

12 lbs. Powdered Milk
5 lbs. High grade meat and bone scrap
5 lbs. Fish Meal

When chicks are four weeks old, the amount of milk powder may be reduced one-half and at an age between six and eight weeks, depending on the rate of growth, the milk powder may be left out entirely. However, results indicate more satisfactory growth will be obtained if milk in some form is included in the ration.

Methods of Feeding

Poultrymen are having success with either of two methods of feeding baby chicks, namely, the mash method or the scratch grain method.

Where liquid milk is not available as a source of animal protein, the mash method has the distinct advantage of supplying suitable protein from the start. In either system it is highly advisable to place the feed in troughs or feeders rather than in the litter. Satisfactory feeders are illustrated in this bulletin. They are designed to allow easy access to the feed but at the same time prevent the chicks getting into them and contaminating or wasting feed. Another good method is that of feeding through panels made of perpendicular slats or wires close enough together to prevent chicks getting through, yet allowing easy access to feed and drink containers secured to the outer side. Whichever system (mash or scratch grain) is used to begin with, the procedure is to include both systems after the chicks are two weeks of age.

In addition to the above mentioned advantage, the mash method of starting chicks embodies a system in which there is less danger of overfeeding and less labor involved,

since the frequent feeding of small amounts of chick scratch grain is eliminated. The mash may be safely kept before the chicks at all times after they are from 48 to 72 hours old. Such is the practice at the Experiment Station. In the mash method it is important to provide sanitary feeders in sufficient numbers to allow the chicks access to feed and to avoid crowding. Eight feet of hopper space for 100 chicks is not too much. Either home-made wooden feeders or galvanized iron feeders embodying the sanitary features may be used with satisfaction. Where early chicks are kept in close confinement it may be desirable to allow the feeders to become empty for a short while each day, or until the chicks show evidence of hunger. However, do not allow the chicks to become excessively hungry as such a practice causes them to crowd and pile at the feeders when fresh feed is given.

If scratch grain is given as the starting feed, it should be fed sparingly and at frequent intervals. There is a tendency to overfeed with scratch grain which must be avoided or the chicks may lose their appetites and become unthrifty.

The practice of night lighting as a means of early and late feeding is not believed to be advisable except where chicks are being reared for the market or for short periods of production. Orderly and continuous na-

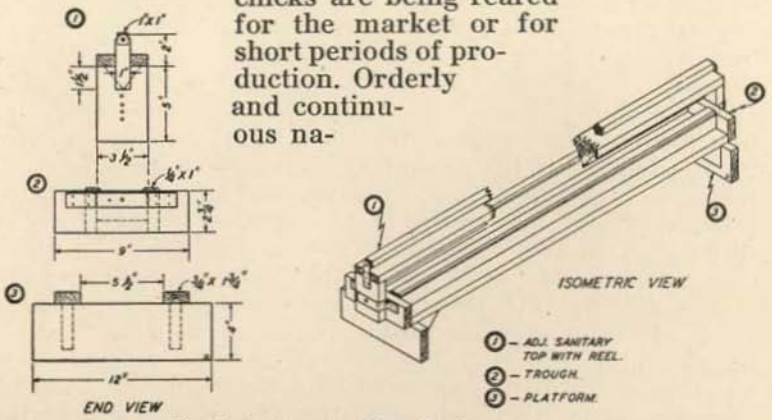


Fig. No. 8. Sanitary Mash Hopper for Chicks.

tural growth is desired. Any practice of forcing for development or maturity will be reflected in a decreased annual production of the pullet.

Under average conditions mash may be kept available in self-feeders. A small quantity of scratch feed may be

fed in the morning in troughs and a more liberal allowance given as the evening meal.

Direct Sunlight for Early Chicks

Early chicks should have access to as much direct sunlight as weather conditions will permit. At times it is safer to provide direct sunshine on the brooder house floor than to get the chicks out of doors. It must be kept in mind that in order to be useful, sunshine must come through open windows since the beneficial part (the ultra-violet ray) will not pass through window glass. It is desirable to have the window arrangements such that openings may be sufficiently high above the floor to prevent wind blowing directly on the chicks yet providing a maximum amount of sunshine on the brooder floor. The double sash window shown in the illustrations is arranged so that the upper sash is hinged to the lower which is held in place by buttons. This arrangement will provide direct sunshine to the extent that weather conditions will permit. It is beneficial to get the chicks out-of-doors into direct sunshine as early as possible. Chicks should be encouraged to go out-of-doors when they are from one to two weeks old, depending on the weather conditions. They must be taught the habit of going in and out of the house. Some poultrymen prefer to open the chick doors as soon as the chicks are hover-broken and, by placing feeders and drink dishes outside, allow the chicks to find their own way out and in the house. Others prefer to drive all the chicks out and in the house several times for the first few days, thereby teaching them the habit of going in and out. In any case the object is to get all the chicks out of doors into direct sunshine as early as possible. Care should be taken not to allow the chicks to chill. If the weather is inclement, drive them back into the house. Small yards are advisable at first while the chicks are learning to go to and from the house.

Prevention of Floor Drafts

When windows are opened to admit direct sunshine, some precaution is necessary to prevent cold floor drafts. The floor guard shown in the illustration, when used in connection with coal stoves, accomplishes this purpose. Fresh air and a uniformly warm condition under the hover are thus provided. This arrangement also provides a cool feeding area in the front of the brooder house. Where the furnace type brooder is used, the front curtain

on the hover extending to within 2 inches of the floor accomplishes the same purpose.

Sleeping Conditions for the Chicks

Thrift in chicks is influenced as much by the sleeping conditions during the night as by the feed and management during the day. The temperature under and near the hover should be such that chicks will settle down without crowding. The hover space in the furnace type brooder or the use of floor guards in connection with coal burning stoves provides ample space. With this floor guard arrangement, as many chicks will sleep in front of the hover as in the rear. The tendency with the canopy type of brooder stove is for chicks to congregate in the most comfortable areas. With the floor guard a more uniform condition of temperature and ventilation is provided and the chicks are inclined to form the desired circle when settling for the night. Night ventilation should be admitted through openings near the ceiling which in the types of houses herein illustrated may be through the top window openings. Chicks that sleep comfortably during the night greet the attendant in the morning with an evidence of vigor and vitality. Chicks that crowd, sweat, become chilled, or are otherwise uncomfortable during the night are devitalized and exhibit little or no desire for feed in the morning.

Roosting

Chicks should be encouraged to roost as early as possible. This can best be accomplished by the use of slanting frames covered with small mesh wire and extending from the floor near the hover to about 18 inches high at the rear or side walls. Perches may be placed on top of these frames. Such slanting wire frames force the chicks to go up to the roosts, preventing crowding, smothering, and direct contact with the droppings.

Sanitary Precautions

At the present time the matter of producing healthy pullets is the greatest limiting factor to poultry raising. Avoid practices which will allow chicks to become infected during the brooding stage. Prevention of disease or parasitic infestations is paramount.

In many instances unthrifty pullets are the result of disease and parasitic infestation starting during the brooding period. Cleaning the brooder house or brooding quarters as frequently as twice a week aids materially in

preventing infection of coccidiosis and other parasitic ailments. With the furnace type brooder house where sand floors are used the top one-fourth inch should be removed at each cleaning and replaced with clean dry sand.

The elevation of feeders and drink fountains on platforms helps to keep filth out of them. The wire covered platform, as well as slotted or wire feeder fences used by many poultrymen, help materially in providing this sanitation. Devices above feeding troughs to keep the chicks out of the feed or to prevent roosting on the feed dishes, as well as covered drink fountains are essential features in providing proper sanitation.

Under average farm conditions the brooder house should be in a yard that has not been used for chickens or other poultry for the previous two seasons. Where a rotation of yards is impossible, wire bottomed sunyards as shown in the illustration become necessary as a precaution in disease prevention.

Remove Cockerels Early

Cockerels should be separated from the pullets as soon as it is possible to determine sex. Pullets will grow and develop better when not annoyed by cockerels. Chicks soon outgrow their quarters, and removing the cockerels relieves congestion.

Fatten cockerels and sell them as early as possible. When they weigh about 1¼ to 1½ pounds, confine them to a fattening ration. A good fattening ration is 60 pounds of yellow corn meal, 20 pounds of oat flour, 20 pounds of low grade flour, 5 pounds of chick size oyster shell, and 5 pounds of chick size bone meal. Mix with sour skimmilk or buttermilk to a batter of about the consistency of thick cream. Feed the cockerels all they will eat in three feeds each day. Ten to fourteen days are required to finish them for the market after they are placed on forced feed.

Get the Pullets on the Range Early

The date of hatch and the season will determine the age at which pullets must be put out on the range. The date chicks should be hatched must be determined by the experience of the poultryman. April is the best date for the person with limited experience ,but the more experienced may hatch earlier. February is a good hatching date for the expert.

The weather, in most sections, is sufficiently settled by

June first to permit placing pullets on the range with perfect safety. The "open type range colony house" which is illustrated in this bulletin is especially suitable. It is open, thus admitting fresh air. These houses are intended to accommodate 100 pullets. Crowding must be avoided. Cover floor with wire to prevent contact with droppings. Provide natural shade. Grow sunflowers for shade if necessary.

A meadow with a cornfield adjoining is ideal for pullet range. Space the houses about 100 feet apart along the meadow near the cornfield. When pullets are taken to the range confine them to the house for a day or two. Late in the evening of the second day open the doors of the house and permit the pullets to go outside. Scatter some feed near the doors so that the pullets may eat and become contended. As night comes on they will go back into the house and roost. Pullets from different houses

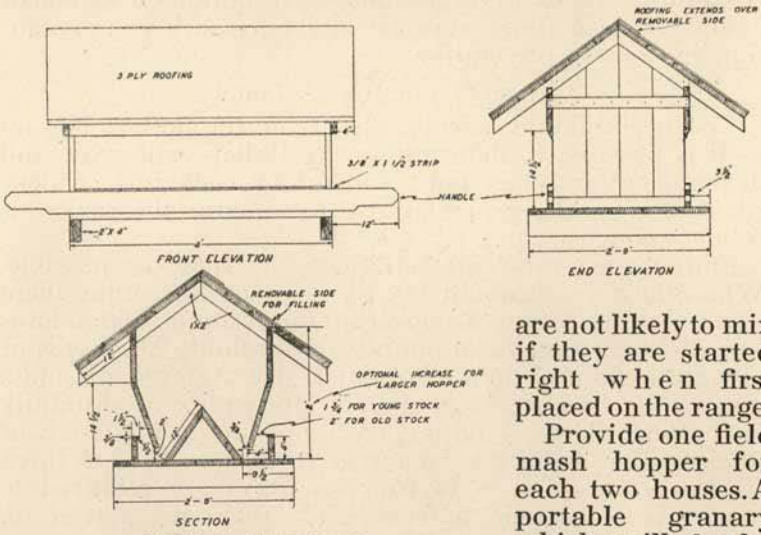


Fig. No. 9. Mash Hopper.

are not likely to mix if they are started right when first placed on the range.

Provide one field mash hopper for each two houses. A portable granary which will hold about one load of scratch feed is a convenience and a time saver. Keep the hoppers filled with mash and feed grain in troughs in the evening. The evening feed should be of sufficient quantity so that the pullets may eat to capacity and yet leave some for morning. If this feeding practice is followed one grain feeding each day is sufficient. Clean water must be provided. Move all range equipment frequently. Avoid the fly menace.

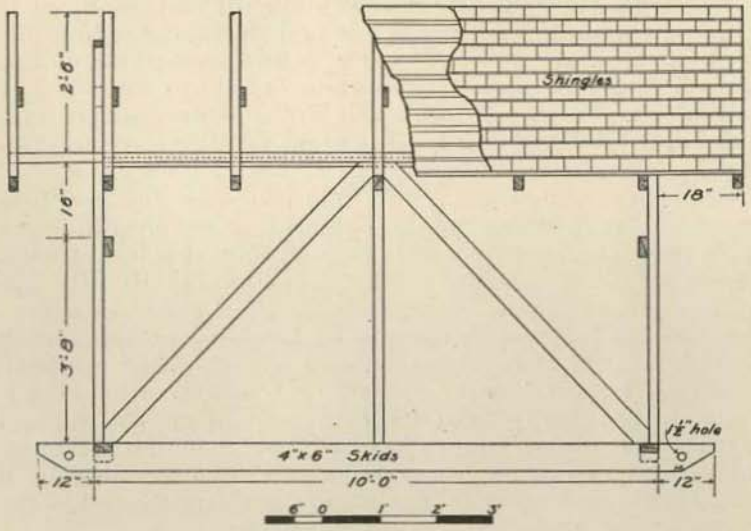


Fig. No. 10. SIDE ELEVATION. OPEN AIR RANGE HOUSE.

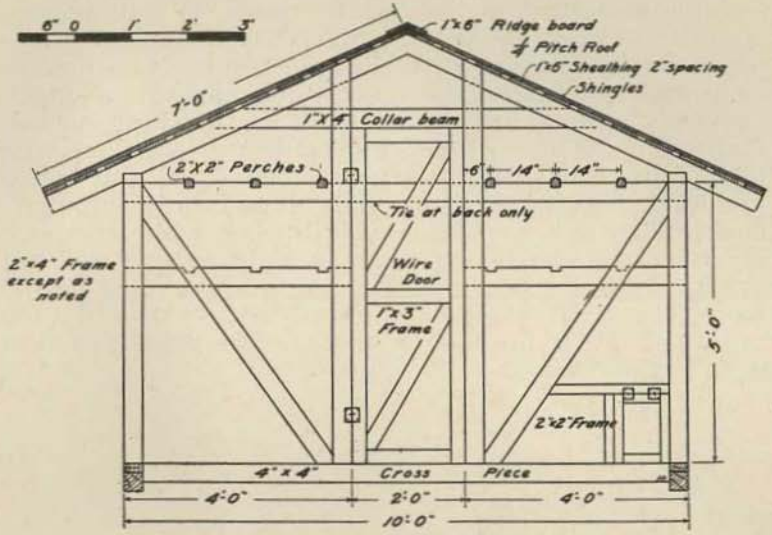


Fig No. 11. END ELEVATION. OPEN AIR RANGE HOUSE.

The same feed formula as outlined for development is suitable for pullets on range. It is a decided feeding advantage, however, to increase the yellow corn. One gallon of milk daily per hundred pullets or where milk is not available, a mash containing 10 per cent animal protein, will supply sufficient animal protein for the finishing period.

Feed requirements may be determined by the development of the pullets. Chicks should grow continuously from the time they are hatched until they reach maturity. They should not, however, develop abnormally . By abnormal development is meant that they come into production too young and too small. Leghorn pullets which reach maturity at from five to six months of age are best.

Larger breeds should mature at correspondingly advanced ages. Fully developed means full grown, yet not laying. The poultrymen's problem is to watch development and feed accordingly. The poultryman must be a good feeder. A good feeder is one who understands the needs of his stock and feeds accordingly.

Pullets may start laying too early. This inclnation must be retarded if possible until the pullets have reached the age when they should start to lay. This is done by feeding for flesh. Do not retard growth. Increase the corn in the ration and feed for flesh, making the pullets as fat as possible while they are yet on the range. It may be necessary to increase the corn to the extent of an almost entire ration to accomplish the desired results. Continue to feed mash. Corn meal, however, may constitute as much as 80 per cent of the mash during the finishing period. Eighty pounds of corn meal, 10 pounds of oat flour, and 10 pounds of bran make a good finishing mash. When the pullets are fat, they are ready to go into laying quarters. Pullets that have been well finished while on range are ready for the laying mash as soon as they are put into their winter quarters. Forcing mashes must be fed with caution. If the pullets show a tendency toward a too rapid increase in production, increase the volume of corn meal in the mash.

PERMANENT FURNACE TYPE BROODER HOUSE 34′ x 16′
PLAN SERIAL NO. P.H.4B.

Bill of Material

Detail of Framing Material

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
9	16′	2x4	18	7′6″	Studding—Front wall
9	10′	2x4	18	4′8″	Studding Rear wall
3	16′	2x4	6	8′	Studding
9	12′	2x4	3	7′	Studding
			3	5′	Studding
			3	6′6″	Studding } Side wall and partition
			3	5′4″	Studding
			3	6′3″	Studding
			3	5′8″	Studding
3	6′	2x4	3	6′	Joists
1	10′	2x4	4	2′6″	Window header
1	8′	2x4	2	4′	Door header
4	12′	2x4	4	12′	Plate—front
2	10′	2x4	2	10′	Plate—front
4	12′	2x4	4	12′	Plate—rear
2	10′	2x4	2	10′	Plate—rear
18	18′	2x6	18	18′	Rafters
4	12′	2x4	4	12′	Sills
2	10′	2x4	2	10′	Sills
3	16′	2x4	3	16′	Sills
4	8′	1x4	4	8′	Corner b'd—front
4	6′	1x4	4	5′	Corner b'd—rear
1	16′	2x6	4	4′	Window sills
1	10′	2x6	3	3′	Window sills
3	10′	1x4	6	4′6″	Window trim
1	8′	1x4	3	2′4″	Window trim
4	8′	1x3	8	4′	Curtain frames
4	10′	1x3	12	3′	Curtain frames
1	10′	4x4	6	10′	Coop Supports
40	10′	1x4	40	10′	Coop frames
3	12′	1x4	15	2′	Coop frames
2	12′	1x2	15	1′4″	Coop frames
24	10′	2x2	24	10′	Coop floor
6	10′	2x2	24	2′6″	Coop floor
3	10′	1x10	3	10′	Hopper top
6	10′	1x4	6	10′	Hopper sides
3	10′	1x4	3	10′	Hopper bottom
4	10′	1x6	4	10′	Hover sides
2	8′	1x6	4	4′	Hover ends
2	14′	2x4	20	15¼″	Hover frames
2	8′	¼x1	4	4′	Hover strips
4	10′	¼x1	4	10′	Hover strips

PERMANENT FURNACE TYPE BROODER HOUSE—*Continued*

Summary

No. of Pieces	Length	Size of Stock	Material	Board Feet
1	10′	4x4	No. 1 common fir	14
18	18′	2x6	No. 1 common fir	324
1	16′	2x6	Clear white pine	16
1	10′	2x6	Clear white pine	10
15	16′	2x4	No. 1 common fir	182
2	14′	2x4	No. 1 common fir	19
21	12′	2x4	No. 1 common fir	168
16	10′	2x4	No. 1 common fir	107
1	8′	2x4	No. 1 common fir	6
3	6′	2x4	No. 1 common fir	12
3	10′	1x10	No. 1 common fir	25
4	10′	1x6	No. 1 common fir	20
2	8′	1x6	No. 1 common fir	8
49	10′	1x4	No. 1 common fir	164
3	10′	1x4	Clear white pine	10
5	8′	1x4	Clear white pine	14
3	12′	1x4	No. 1 common fir	12
4	6′	1x4	Clear white pine	8
4	8′	1x3	No. 1 common fir	8
4	10′	1x3	No. 1 common fir	10
30	10′	2x2	No. 1 common fir	100
2	12′	1x2	No. 1 common fir	4
2	8′	¼x1	No. 1 common fir	
4	10′	¼x1	No. 1 common fir	
				1241
		1x8	Shiplap, No. 1 common fir	800
		1x8	Drop siding, No. 1 common fir	1050
			Total Lumber	3091

Miscellaneous

6 8″x10″ 6-light window sash
2 10″x12″ 4-light window sash
2 cellar window sash
12 3″ window hinges
120′ ½-inch mesh hardware cloth, 30″ wide
150′ Hexagonal chick wire, 30″ wide
1300 Brick
32′ Iron flu tops
6 Door hinges
8 Rolls roofing

9 cubic yards concrete 1:2:4), depending on height of foundation and depth of footing
2 bundles lath
40 pounds 8d common nails
8 pounds 10d common nails

PORTABLE FURNACE TYPE BROODER HOUSE 34′ x 14′
PLAN SERIAL NO. P.H.4A.

Bill of Material

Detail of Framing Material

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
4	18′	6x6	4	18′	Skids
9	16′	2x4	18	7′6″	Studding—Front wall
9	10′	2x4	18	4′8″	Studding—Rear wall
3	16′	2x4	6	8′	Studding
9	12′	2x4	3	6′8″	Studding
			3	4′8″	Studding
			3	6′3″	Studding
			3	5′	Studding
			3	5′10″	Studding
			3	5′6″	Studding
2	12′	2x6	4	6′	Splice on skids
4	12′	2x4	4	12′	Plate—rear
2	10′	2x4	2	10′	Plate—rear
4	12′	2x6	4	12′	Plate—front
2	10′	2x6	2	10′	Plate—front
18	16′	2x6	18	16′	Rafters
3	14′	4x4	3	14′	Sills
3	6′	2x4	3	6′	Joist
4	8′	1x4	4	8′	Corner b'ds—front
2	10′	1x4	4	5′	Corner b'ds—rear
1	16′	2x6	4	4′	Window sills
1	10′	2x6	3	3′	Window sills
3	10′	1x4	6	4′6″	Window trim
1	8′	1x4	3	2′4″	Window trim
2	14′	2x8	2	13′	Guards
4	8′	1x3	8	4′	Curtain frames
3	12′	1x3	12	3′	Curtain frames
4	10′	1x6	4	10′	Hover sides
2	8′	1x6	4	4′	Hover ends
2	16′	2x4	20	15¼″	Hover frames
2	8′	¼x1	4	4′	Hover strips
4	10′	¼x1	4	10′	Hover strips

Side wall and partition

Summary

No. of Pieces	Length	Size of Stock	Material	Board Feet
4	18′	6x6	No. 1 common fir	216
6	12′	2x6	No. 1 common fir	72
3	10′	2x6	No. 1 common fir	30
18	16′	2x6	No. 1 common fir	288
1	16′	2x6	Clear white pine	16
3	14′	4x4	No. 1 common fir	56
2	14′	2x8	No. 1 common fir	38
14	16′	2x4	No. 1 common fir	149¼
13	12′	2x4	No. 1 common fir	108
11	10′	2x4	No. 1 common fir	73¼
3	6′	2x4	No. 1 common fir	36
4	10′	1x6	No. 1 common fir	20
2	8′	1x6	No. 1 common fir	8
5	8′	1x4	No. 1 common fir	14
2	10′	1x4	No. 1 common fir	8
3	10′	1x4	No. 1 common fir	10
4	8′	1x3	No. 1 common fir	8
3	12′	1x3	No. 1 common fir	10
2	8′	¼x1	No. 1 common fir	
4	10′	¼x1	No. 1 common fir	
				1130½
		1x8	No. 1 common shiplap	850
		1x8	No. 1 drop siding	1000
				1850
			Total of lumber	2980½

Miscellaneous

6 rolls prepared roofing
7 yards burlap, 36″ wide
6 yards muslin, 36″ wide
6 8″x10″ 6-light window sash
2 10″x12″ 4-light window sash
12 3″ window hinges
52″ 8″ clay sewer pipe
275 brick
7 cubic feet concrete (1:2:4 mix)
40 pounds 8d nails
10 pounds 16d nails
16 ¾″x10″ bolts with nuts and washers

Colony House 10′ x 14′
Bill of Materials
Detail of Framing Materials

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
6	18′	2x4	6	16′5″	Rafters
4	10′	2x4	4	10′	Plate
4	16′	2x4	8	7′2″	Studding—Front wall
4	12′	2x4	8	5′2″	Studding—Rear wall
1	12′	2x4	2	5′5″	Studding (Side wall)
		2x4	2	5′8″	Studding (Side wall)
1	14′	2x4	2	6′1″	Studding (Side wall)
		2x4	2	6′4″	Studding (Side wall)
		2x4	2	6′8″	Studding (Side wall)
		2x4	2	6′11″	Studding (Side wall)
2	10′	2x4	2	10′	Rafter supports
10	10′	2x4	10	10′	Joist
2	12′	2x4	4	6′	Roost supports
2	14′	2x4	2	14′	Sill
2	10′	2x4	2	10′	Sill
1	8′	2x4	1	8′	Window frames
1	10′	2x6	1	10′	Window sills
1	16′	2x4	1	16′	Door frames
2	16′	4x6	2	16′	Skids
5	10′	2x2	5	10′	Five roosts

Summary

No. of Pieces	Length	Size of Stock	Material	Board Feet
5	10′	2x2	No. 1 common fir	1.7
1	8′	2x4	No. 1 common fir	5.3
18	10′	2x4	No. 1 common fir	120
8	12′	2x4	No. 1 common fir	64
6	14′	2x4	No. 1 common fir	56
5	16′	2x4	No. 1 common fir	54
6	18′	2x4	No. 1 common fir	72
1	10′	2x6	No. 1 common fir	10
2	10′	4x4	No. 1 common fir	27
2	16′	4x6	No. 1 common fir	64
				474.0
		1x4	No. 1 common flooring	140
		1x8	No. 1 common shiplap	950
		1x4	No. 1 common pine trim	60
				1150
			Total of Lumber	1624

Miscellaneous

8 ½" carriage bolts, 10" long
1 Rim lock door set
4 8"x10" 6-light barn sash
1 8"x10" 4-light barn sash
2 Rolls of 3-ply composition roofing
3 Pairs of 3" butt hinges
12 Thumb buttons for holding window in place
1 Pair door hinges
20 lb of 8d nails
10 lb of 10d nails

Note: The addition of building paper between the two floors adds materially to the warmth of the portable colony house. This bill of material does not include any interior equipment except the roosts. The material listed allows for the least possible amount of waste and unless great care is taken in the construction, additional material will be required.

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