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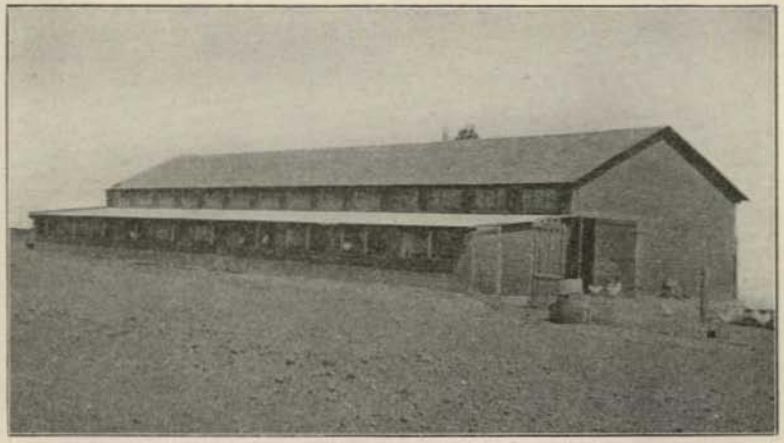
HOUSING FARM POULTRY



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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The essentials in Poultry Housing are:

1. Sanitation.
2. Comfort.
3. Sufficient ventilation.
4. Freedom from moisture.
5. Distribution of light.
6. Ample floor space.
7. Convenience.
8. Durability.
9. Economy.
10. Protection against destructive animals.

Poultry houses should be tight on three sides—East, North and West.

Have no more head space than is necessary for the attendant.

Do not use curtains except when necessary to keep out rain or snow.

Do not close hens in tightly during cold weather.

Build houses deep from south to north—not less than 24 feet.

Provide droppings boards.

Provide some glass in back wall under droppings boards.

Ceil space over droppings boards.

Provide floor in house as a sanitary and efficiency measure .

Put all equipment off the floor.

Shed types may be remodeled.

Do not permit carpenters to alter the plans as outlined in this bulletin.

HOUSING FARM POULTRY

By

*Pren Moore, C. E. Lampman, Frank E. Moore, and Hobart Beresford.

PROPER housing of hens is real economy regardless of the size of flock. Winter egg production is of utmost importance and is possible only when housing conditions are correct. Mites are more easily controlled, sanitation provided more readily, and disease made less a menace in houses that are properly constructed.

In the construction of a poultry house conveniences and labor saving devices such as large mash hoppers, movable perches, droppings and feed carriers, suitable nests, and running water are great factors in reducing the routine labor which is one of the large items in overhead costs.

LOCATION

Poultry houses should be located in sheltered places that afford good soil and air drainage and which are convenient to other farm units. Wind protection is desirable where possible, if it does not exclude direct sunlight during the winter.

ESSENTIAL FEATURES OF A POULTRY HOUSE

The essential features of a properly constructed poultry house are: (1) sanitation; (2) comfort; (3) ventilation; (4) direct sunlight; (5) distribution of light; (6) dryness; (7) ample floor space; (8) convenience; (9) durability; (10) economy of construction and (11) protection against destructive animals.

HEALTH AND COMFORT OF THE FLOCK

Sanitation: In modern houses sanitation is less a problem in that concrete floors are provided and droppings boards and removable perches constitute the essential equipment, all of which are easily cleaned and disinfected.

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* The manuscript and drawings for this bulletin were prepared by Pren Moore, Poultry Specialist in the Extension Division; C. E. Lampman, Professor of Poultry Husbandry and Poultry Husbandman of the Experiment Station; Frank E. Moore, Assistant Poultry Husbandman of the Experiment Station; Hobart Beresford, Professor of Agricultural Engineering and Agricultural Engineer of the Experiment Station.

Drinking founts and milk pans should be on platforms, and provisions made so that all other fixtures may be up off the floor.

Comfort: Comfort for hens is a prime factor for consideration in poultry house construction. The more that is expected of laying hens as producing units the greater is the requirement for their comfort. The plans of the houses and equipment herein contained are designed to meet these requirements. The straw loft feature tends toward greater comfort in that it provides overhead insulation, which insulates against extreme cold in winter and heat in summer.

Ventilation: The inclination of the average poultryman is to under ventilate or deprive hens of sufficient fresh air. An abundance of fresh air is essential in cold weather. The air that hens exhale is saturated with moisture and there must be sufficient ventilation in the poultry house to carry out the excess moisture in the atmosphere. Damp air produces a condition of discomfort in which the tendency is for the stock to chill and the combs and wattles to become frosted when the weather is cold. Poorly ventilated and damp houses devitalize stock, thereby lowering their resistance to disease. Therefore, houses should never be closed tight even in the coldest weather.

Damp Litter: Damp litter is one of the major problems in poultry house management during cold weather. This condition may be due to inadequate ventilation but is often the result of faulty floor construction. Board floors are extremely difficult to keep dry and are therefore not recommended. To insure a dry concrete floor a fill of rock and gravel of at least ten inches under the concrete is necessary.

Light: Distribution of light to all parts of the house is necessary. There should be no dark corners. The plans provide windows in the north wall under the droppings board so that light may be distribued to all of the floor area. In houses admitting light from the front only, the hens scratch the litter to the rear of the house, thus piling it up under the droppings boards. The windows in the north wall as illustrated tend to overcome this difficulty.

Direct Sunlight: Recent experimental work has established the value of the ultra-violet rays to the health and vitality of poultry. The most economic source of the ultra-violet rays is from direct sunshine. It is, therefore, essential to make use of the direct sun-

shine in winter to the greatest possible extent consistent with other necessary housing features. The ultraviolet rays of winter sunshine are most potent between the hours of 10 A. M. and 2 P. M. which makes it advisable to open the windows as much as weather conditions will permit during these hours on sunny days.

Artificial Light: Laying hens require great quantities of feed. During the winter it is desirable to provide artificial light in order that the period for feeding may be lengthened and the period of hunger over night shortened. When laying hens become hungry they chill very readily. Sufficient artificial lighting to provide approximately a twelve hour feeding period appears necessary. If lights are used in the evening, some provision should be made for dimming them for a short time before they are turned off entirely. This period of dim light gives the hens time to go on the perches.

Floor Space: Over crowding hens is a common fault. The floor space for hens is determined by the breed of poultry and the number of birds in a housing unit. For small flocks more floor space per hen is required. Heavy breeds require four square feet per bird and Leghorns three and one-half square feet per bird when housed in small units and correspondingly less when the number of birds in a housing unit is increased. Two and one half to three feet per bird for Leghorns in flocks of one thousand is common practice in commercial districts and correspondingly more space for the larger breeds.

Economic Factors

Convenience: Every convenience which tends to reduce labor in the routine management of the flock consistent with good practice should be provided. Large mash hoppers that are convenient to fill, droppings boards that are easily cleaned, droppings and feed carriers, and convenient nests are recommended. Litter supply and grain bins in the building and running water should be provided where possible.

Durability and Economy: A new poultry house should be planned in the light of a permanent investment. Good materials and proper construction insure durability and are more economical as an investment. The house need not necessarily be expensive to be satisfactory. However, good lumber should be used in order that the north, east, and west walls will be tight. A concrete floor may add some to the initial cost of construction but is more durable, more

easily cleaned, is rat proof, and is, therefore, recommended in preference to wood floors.

The Straw Loft Feature

The advantages of the straw loft feature are: (1) improved ventilation; (2) insulation from excessive heat and cold; (3) ample and convenient storage of straw for litter. Excessive moisture is one of the major winter problems. While the straw loft may not entirely overcome this defect, much of the moisture may be removed by the increased ventilation which it provides. Straw lofts tend to reduce the intense heat in summer, which adds much to the comfort of the hens. In addition to this it provides insulation in the winter which modifies the severity of intense cold overhead.

Two plans of the straw loft are shown in this bulletin. (1) the modified half-monitor; (2) the gable roof type. The gable roof house is provided so that should it be desired, it may be remodeled to the half-monitor type. Cupolas are designed in the peak of the roof of the straw loft houses to allow the escape of moist air which will filter up through the straw; thus preventing frost from collecting on the under side of the roof.

Heat Aids Ventilation

It is apparent that no system has been devised that entirely controls moisture to the extent dsired in winter except by the use of some heat. While ordinary methods of ventilation now in use may help control the moisture problem, it can only reduce humidity to the extent of the general atmospheric conditions of the outside air. There are periods of extreme atmospheric humidity when ordinary methods of ventilation are inadequate.

It is apparent that some heat is necessary in order that air circulation be stimulated and a dry atmospheric condition produced. Too much heat is to be avoided. It is understood that the heat supplied is for a drying effect rather than that of raising the temperature within the houses. There are various systems of heating that may be employed, but the furnace type under-ground system which is described in this bulletin is low in cost, easily constructed, and economical to operate. When built according to plans in this bulletin, the results have proven to be very satisfactory.

THE THIRTY-SIX FOOT HALF-MONITOR LAYING HOUSE

The thirty-six foot half-monitor laying house and the thirty-six foot modified half-monitor straw loft laying house have the same floor plan, figure 1A, and the same capacity, but differ in the manner in which the walls and roof are constructed.

Foundation: The staking out of the building may be done by the right triangle method. This method which is illustrated in figure 1, insures square corners because it uses a right triangle whose sides are 6x8x10 feet. Figure 1 shows how the stakes are placed for laying out the initial corner. The batter boards are placed three to six feet back from the foundation line and are used to support the guide line for digging the trench and building the foundation walls. The batter boards shown in this figure should have their tops level with the proposed floor. Before starting work on the trench enough gravel for the sub-floor should be hauled and dumped inside the proposed foundation wall. The trench for the foundation will vary in depth for the different localities. In those sections where the winters are severe, the foundation should extend a foot or more below ground level in order to prevent heaving and breaking of the wall by frost action. In sections where the winter is mild the foundation depth should be about six inches or sufficient to prevent water from washing under it or wind from blowing the soil away to such an extent that the foundation might be left unsupported. The foundation walls should extend at least a foot above the ground level in order to insure good drainage for the house floor. The forms for the foundation and post footings may be constructed of the shiplap that is to be used for sheathing, and the 2 x 4s that are to be used for studding if care is used in nailing, and if the inside of the form is oiled with crank case oil so that the concrete will not stick to it. The 2 x 4s may be cut to the lengths indicated in the bill of material for studding before using them in the forms. The anchor bolts and drift pins are placed with the head down through cleats across the top

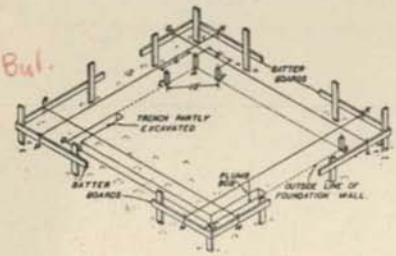

Fig. 1. A method of laying out foundations.

of the forms, in such a position that they will not be under studding and will extend to at least three inches above the concrete when the forms are filled. If the forms are carefully leveled and braced, little difficulty will be experienced in getting straight walls level with the top of the batter boards.

The concrete for the foundation walls and footing is made of a mixture of one sack of cement to two cubic feet

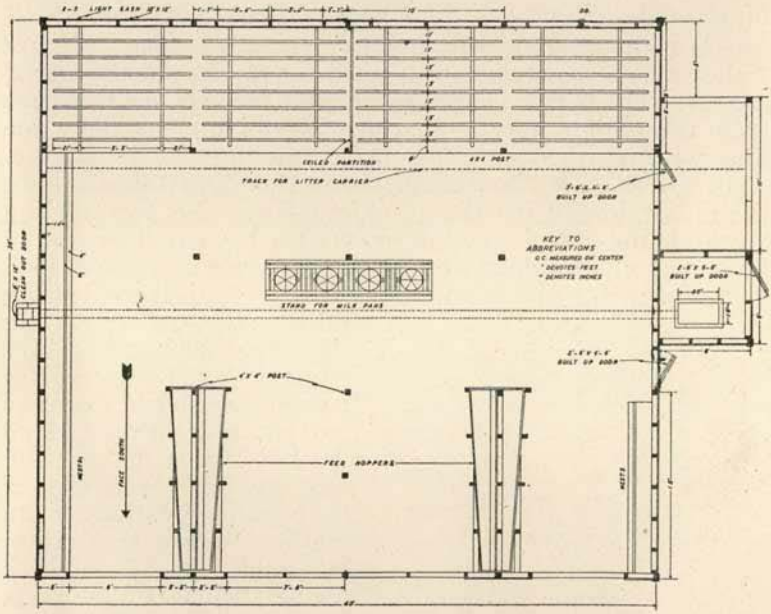

Fig. 1a. Floor plan for the thirty-six foot Half-Monitor and the thirty-six foot modified Half-Monitor straw loft laying house.

of sand and four cubic feet of crushed stone or coarse gravel. A better concrete will be secured if care is taken to select sand that is hard and clean consisting of particles that vary up to one-quarter of an inch in size, free from vegetable matter, fine dust, clay and loam. Clean crushed stone or coarse gravel of varying sizes should be used. If bank run sand and gravel is used the mixture may be run with one sack of cement to five cubic feet of sand and gravel. A more modern method of proportioning concrete is by using just enough water to give the mix a workable consistency for ease in placing. Tests have shown that seven and one half gallons of water per sack is sufficient

to give the strength required for the foundation walls, and that the use of excess water decreases the strength of the concrete. This method is described in detail in a bulletin "Permanent Farm Construction" issued by the Portland Cement Association which may be secured through the Agricultural Engineering Department or by writing direct to the Portland Cement Association. The concrete may be mixed by hand on a water tight platform or by a power driven batch mixer. With machine mixing it is easier to obtain a thoroughly uniform mix than by the hand method although first class concrete can be made by hand. Whichever method is used the mixing should continued until every pebble or stone is completely covered with a coat of sand and cement mortar. After mixing the concrete should be placed in forms as soon as possible. To insure a smooth wall the rocks in the mixture are carefully spaded back from the forms. The forms may be removed after the concrete has been allowed to cure for a period of three or four days.

Floor: The space inside the foundation wall is filled with coarse gravel or stone and tamped down to within three to four inches of the top of the foundation. Not less than ten inches of gravel or crushed stone should be used in the fill. The purpose of this fill is to break the travel of capillary moisture from the earth through to the concrete, and is essential if a dry floor is to be secured. Many poultrymen use water to wash the floor. If this plan is to be carried out in the thirty-six foot house the floor should be three to six inches higher at the back than at the front. This will make the floor level with the foundation in the back and three to six inches lower than the foundation in front. The foundation should be kept level on all sides. For each twenty-foot section of the front wall a piece of three inch iron pipe should be placed level with the proposed floor. These pipes may be provided with plugs and used only when draining wash water. Building paper may be used as a joint between foundation and floor and between the slabs of the floor. For convenient leveling it will be necessary to divide the floor into from two to four strips running lengthwise with the building depending on whether hand or machine mixing is used, and should not be more than ten to fourteen feet in width. Slab forms are shown in figure 2. If the two to three inch floor is used over the fill, great care must be exercised in mixing and placing the concrete to prevent cracking and checking. To make the floor waterproof a 1:2:3 mixture of concrete is recom-

mended. The use of too much water in the mix is to be avoided. Tests have shown that five and one-half gallons of water gives satisfactory results when dry sand and

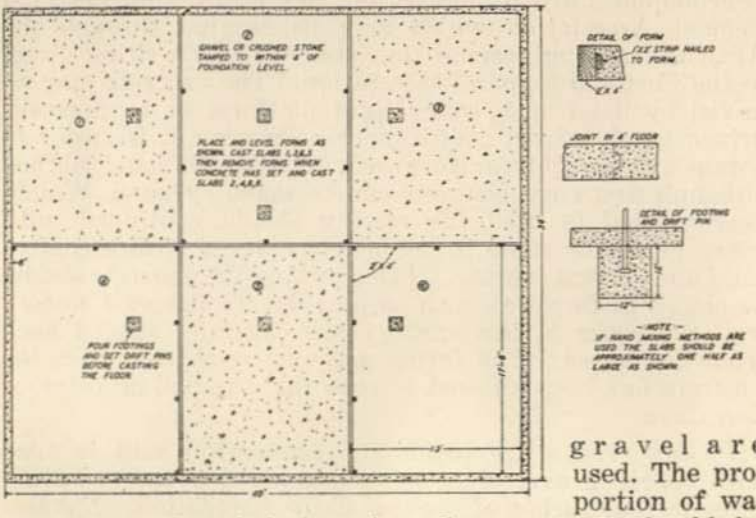

Fig. 2. A method of pouring a large concrete floor.

gravel are used. The proportion of water should be sufficient to give the cement a workable consistency. Pour alternate slabs in a checker board plan and allow three days for curing before the forms are removed and the other slabs poured. After pouring, the concrete should be leveled off with a straight edge and trowled smooth with a steel trowel. Rough finished concrete floors are difficult to keep clean and are very unsanitary. Newly placed concrete should be protected for a period of ten days or two weeks with a moist covering of sand or canvas, or by ponding with water for a like period.

Sills: Holes are bored in the sills corresponding to the bolts set in concrete and the sills are bolted to the foundation. For economy in use of material carefully follow the details given in the bill of material.

Studding and Post: In the half-monitor laying house the 2 x 4 inch studding for the front and rear walls are notched at the top to insure a better union between studding and the 2 x 4 inch plate. The 4 x 4 inch posts in the front and rear walls are notched down two inches below the plate to support the two 2 x 6 inch rafters and to permit the top of the rafters and plate to come flush. The

studding for the end walls are also notched to the 2 x 6 inch end rafters. Figures 3 and 4 show that the rafters are never notched at their supports, but that the posts and studding are cut to conform to the position and slope of the rafters.

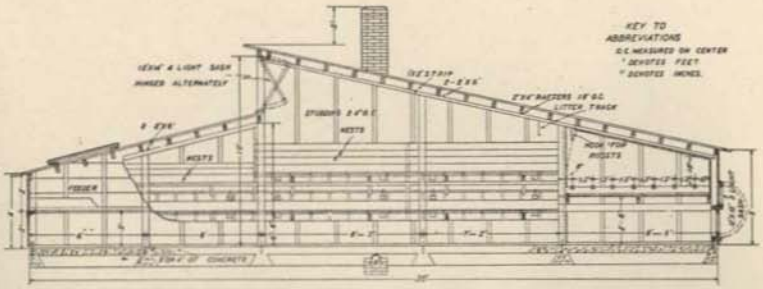

Fig. 3. Framing section of the Half-Monitor Laying House.

Rafters and Plate: The plate and rafter construction shown in figure 4 is used to insure a tight roof at the eaves. Strips of 1 x 2 inch material are nailed to the 2 x 6 inch inclined rafters in such a position that the 2 x 4 inch longitudinal rafters which are supported by them come flush with the top of the 2 x 6 inch rafters. The eighteen inch spacing of the 2 x 4 inch rafters will be necessary in those sections of Idaho where the snow load is likely to be heavy, but twenty-four inch spacing may be used in areas of light snow fall. The 2 x 6 inch rafters in the front section are supported at their upper ends by blocks nailed to posts.

Roofing: Shiplap is used for sheating and it is laid up and down the roof with eight inches overhanging in front and back, and about four inches overhanging at the ends. Three ply roll roofing is recommended because of its economy and because of the fact that it is more suitable for flat roofs than shingles. Openings are left in the front section of the roof for convenience in filling the feed hoppers. Fig 5 shows the construction of the hopper.

Siding: Rustic siding may be used for the walls. The corners and windows are trimmed with 1 x 4 inch No. 1 material.

Roosting Space: The droppings boards may be made of eight inch shiplap although many prefer to use a common grade of flooring because the latter insures a tighter con-

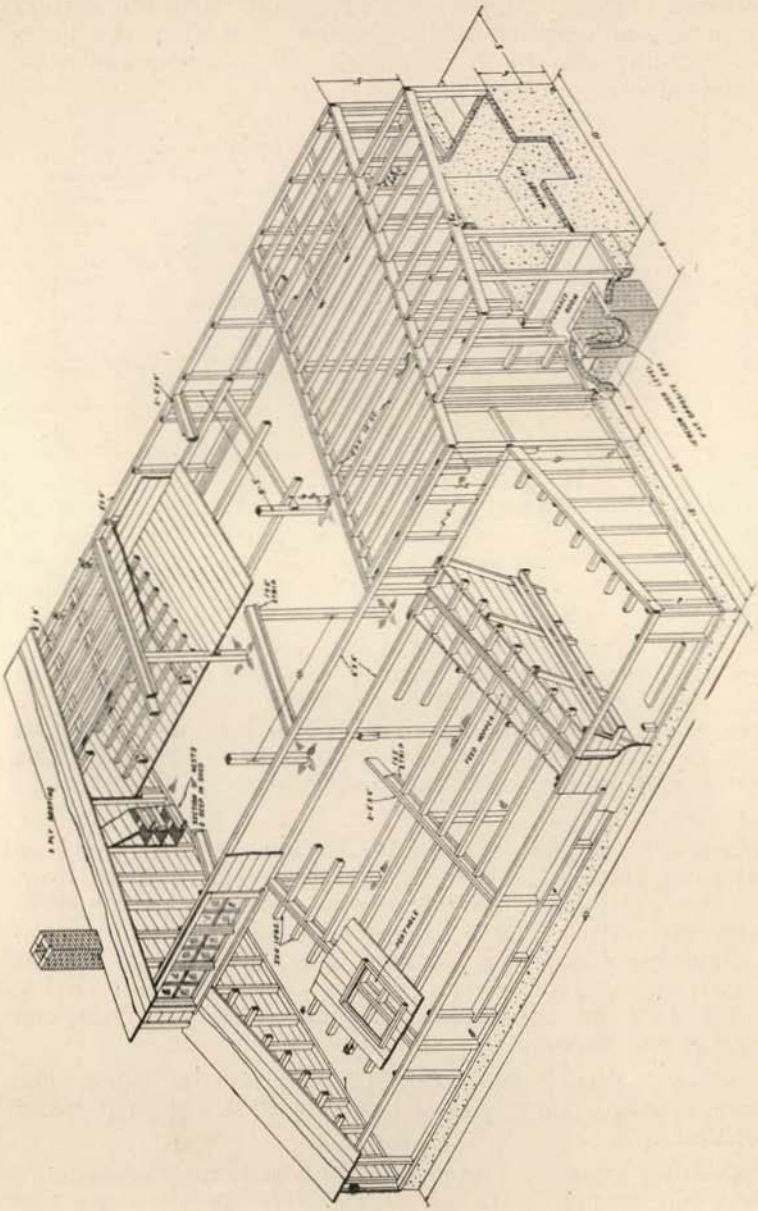

Fig. 4. Isometric drawing of the thirty-six foot Half-Monitor Laying House.

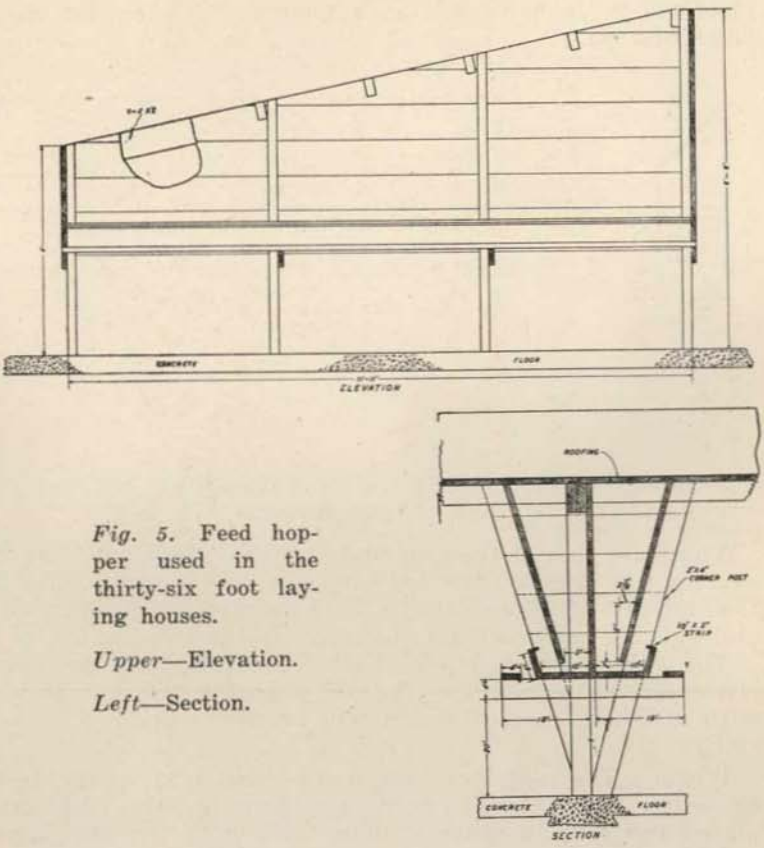

Fig. 5. Feed hopper used in the thirty-six foot laying houses.

Upper—Elevation.

Left—Section.

struction and is easily cleaned. It will be noticed in figures 3 and 4 that the roosting space has the double wall construction and that above the roosts 2 x 4s are nailed against the rafters to form nailing girts for the shiplap which is run lengthwise; this construction permits the air to circulate from under the droppings boards up behind and over the roosts. The roosts are made of 2 x 2 inch pieces fitted into notches in 2 x 4s. The front perch can be nailed securely for lifting the roost in cleaning.

Nests: Detail drawings are shown in figure 6. The bottom of the nests are made of ¼ inch square wire mesh. A 1 x 4 inch board partition between the nests permits the hen to go from nest to nest until she finds an empty one instead of crowding into a nest with another hen. The

platform in front serves as a door for closing the nest when desired.

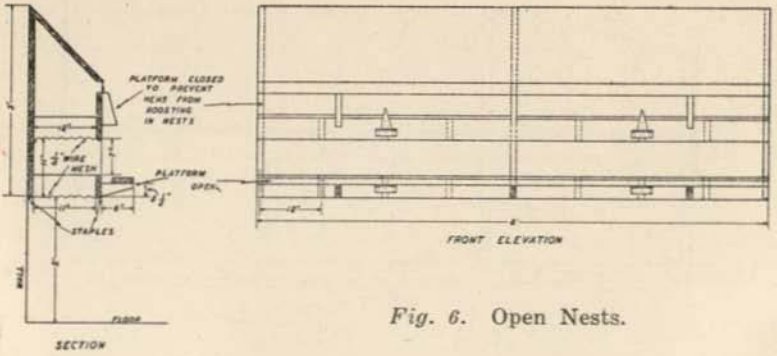

Fig. 6. Open Nests.

Modified Half-Monitor and Gable-Roof Straw Loft Laying Houses

The floor plan of the modified half-monitor straw loft is exactly the same as the half-monitor. The roosts, nests, feed hoppers, furnace details, litter carrier and manure pit and lighting are practically identical in the two houses.

The gable roof portion of the modified half-monitor straw loft is the same as the gable roof straw loft house with a few exceptions which will be taken up in another section.

Walls: The plates of both houses are brought ten feet above the foundation and the studding for the ends are placed two feet on centers. The back walls are the same

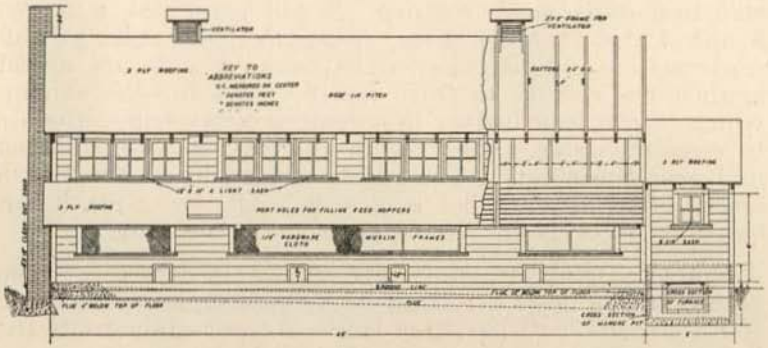

Fig. 7. Front elevation of the thirty six foot modified half-monitor.

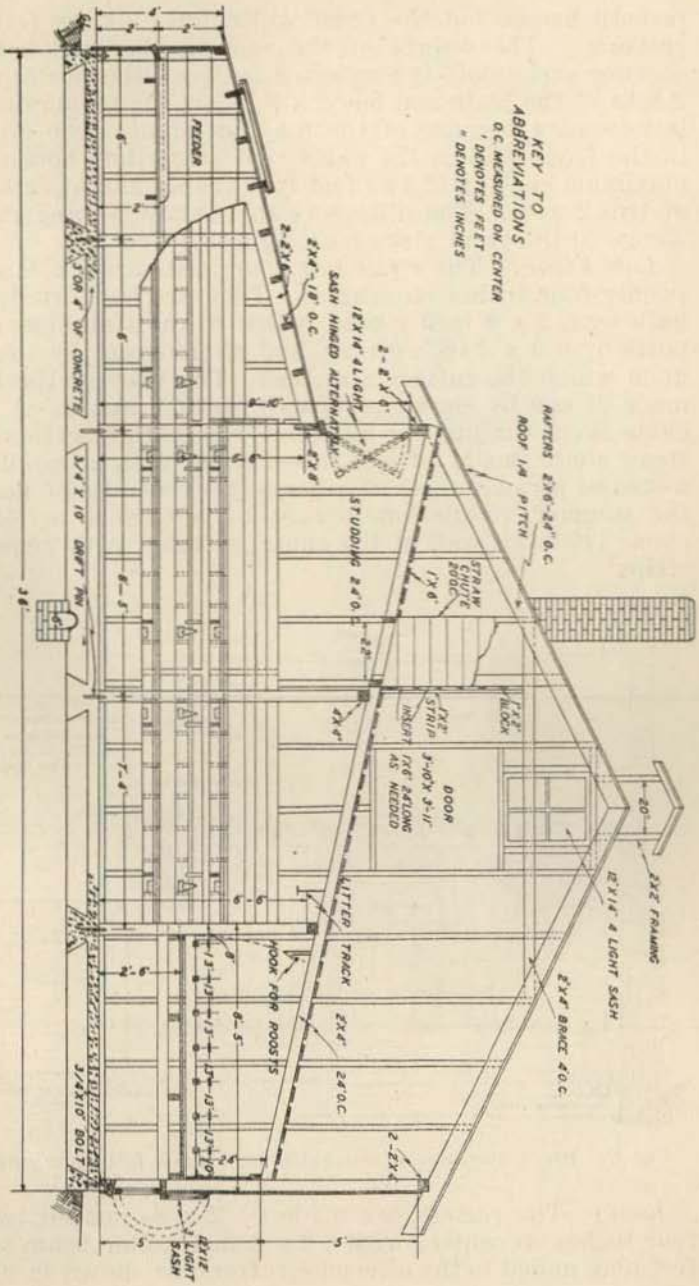

Fig. 7a. Framing section of the thirty-six foot modified half-monitor.

in both houses but the front walls differ in the following respects: The weight of the roof in the modified half-monitor straw loft is supported between the posts by two 2 x 6s at the plate and one 2 x 8 below the windows which is necessary because of the ten foot span. The studding in the front wall in the gable roof straw loft house has a maximum spacing of two feet four inches and a plate made of two 2 x 4s. The difference in window arrangement is shown in the front elevations, figures 7 and 8.

Loft Floor: The straw loft floor joists are 2 x 4s spaced twenty-four inches on centers. They are supported at the back by a 2 x 4 inch ribbon nailed to the studding; at the posts by a 4 x 4 inch girder, and at the front by the plate upon which the rafters also rest. The floor of the loft is made of one by six strips spaced an inch apart. A straw chute is cut through the left for every 20 foot section. The straw chute should be kept closed either with a trap door or a wad of straw in cold weather to prevent loss of heat but for summer ventilation it may be advisable to leave it open. The back wall of the chute is closed with removable strips.

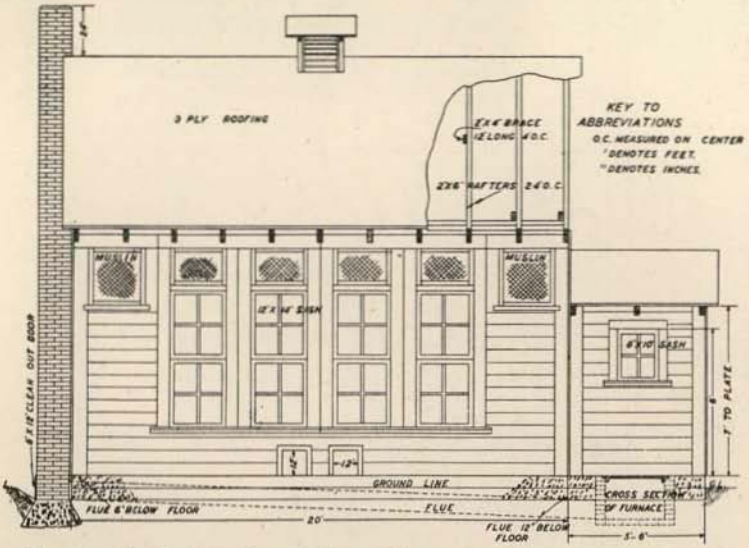

Fig. 8. Front elevation of the gable roof straw loft laying house.

Roof: The rafters are made by 2 x 6s spaced twenty-four inches on centers with a 2 x 4 inch collar beam twelve feet long nailed to the alternate rafters, as shown in figures

7 and 8a. Shiplap is used for sheathing. Roll roofing is used on the front shed and either roll roofing or vertical grain shingles exposed four inches to the weather may be used on the gable roof.

Ventilators: The cupolas shown in the front elevation add something to the appearance of the building and aid in ventilation. The gable windows opened in summer increase circulation.

Roosts: Seven roosts are used in the modified half-monitor straw loft house, and five in the gable straw loft house. The droppings boards are extended to the posts in the former and only to the third studding in the latter. The roosts in both houses are hinged at the back and may be hooked up while the droppings boards are being cleaned.

Furnace: Details of the furnace are shown in figure 9. The room for the furnace is made to conform to the diffenent types of laying houses as shown in figures 4, 10 and 11. The pit is made of common brick laid up with clay mortar on a concrete foundation. The flue under the floor is made

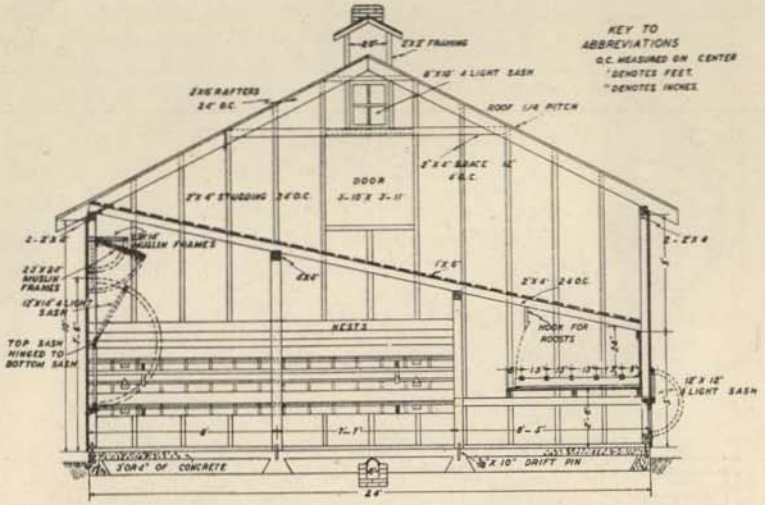

Fig. 8a. Framing section of the gable roof straw loft laying house.

on a concrete base and the bricks are laid up three high without mortar and topped with the cast iron arch*. Sand should be used to fill all the space between the floor, sides

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

and top of the flue so that the heat will be transmitted uniformly to the floor.

The successful operation of the underheat furnace depends upon a good draft. For this purpose a brick chimney has proven best because chimneys which do not hold the heat cause trouble by not drawing or by causing back draft. In the base of the chimney, opposite the end of the inclined flue, an 8x12 inch clean-out door should be provided. With the single flue this type of furnace is adapted to houses up to fifty feet in length. For installation in the larger houses (over fifty feet) the double furnace and double flue are recommended. A furnace should be located in each end of the house and a double flue chimney erected in or about the center depending upon the location of the feed and fuel room. If the axis of the chimney is placed perpendicular to the axis of the house, the clean-outs for the double flue chimney may be located as described for the single furnace. A shallow pit in the floor at the base of the chimney will facilitate the flue cleaning and should be provided with a cast concrete cover. Both the single and double flue chimneys should be built upon substantial concrete bases.

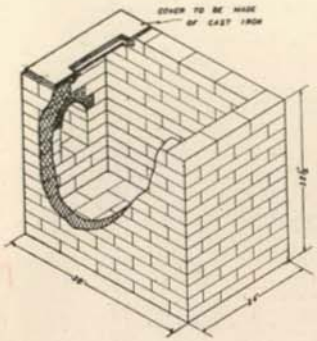

Fig. 9. Under heat type of furnace used in laying houses.

Windows: The front windows are made of 12 x 14 inch four light sash, the rear windows of 12 x 12 inch three light cellar sash and the window of the furnace rooms of

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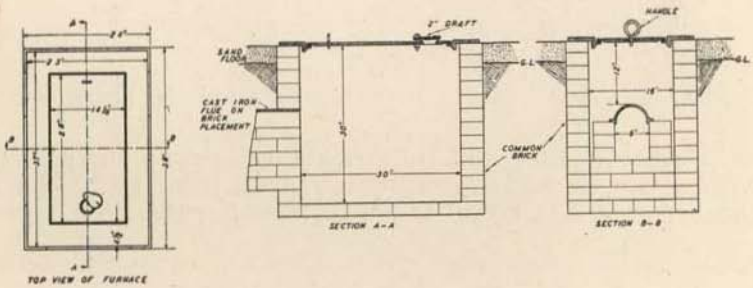

all three houses are made of 8 x 10 inch four light sash. In the modified half-monitor straw loft house the gable ends use 12 x 14 inch four light sash. The front windows in the half-monitor and the modified half-monitor straw loft houses are placed in groups of three. The center window is hinged at the bottom for ventilation and is held part way open with a chain and the others are hinged at the top and may be hooked to the ceiling to admit the direct rays of the sun. The back windows are hinged at the top and for summer ventilation may be opened wide and held against the wall by hooks. The windows in the gable-roof straw loft houses are made up of two 12 x 14 inch four light sashes with the upper one hinged to the top of the bottom sash. The sashes are secured by window stops. This permits the removal of both sashes in very hot weather, and will admit more direct sunshine. The muslin frames are hinged at the top and may be hooked up in warm weather.

Driveway: Double sliding doors may be placed in the ends of the larger houses for convenience in cleaning when

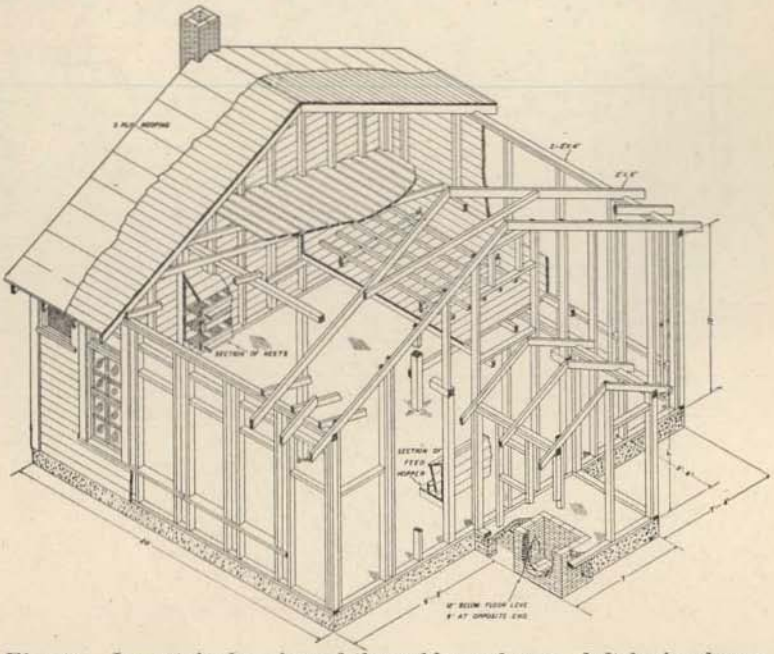

Fig. 10. Isometric drawing of the gable roof straw loft laying house.

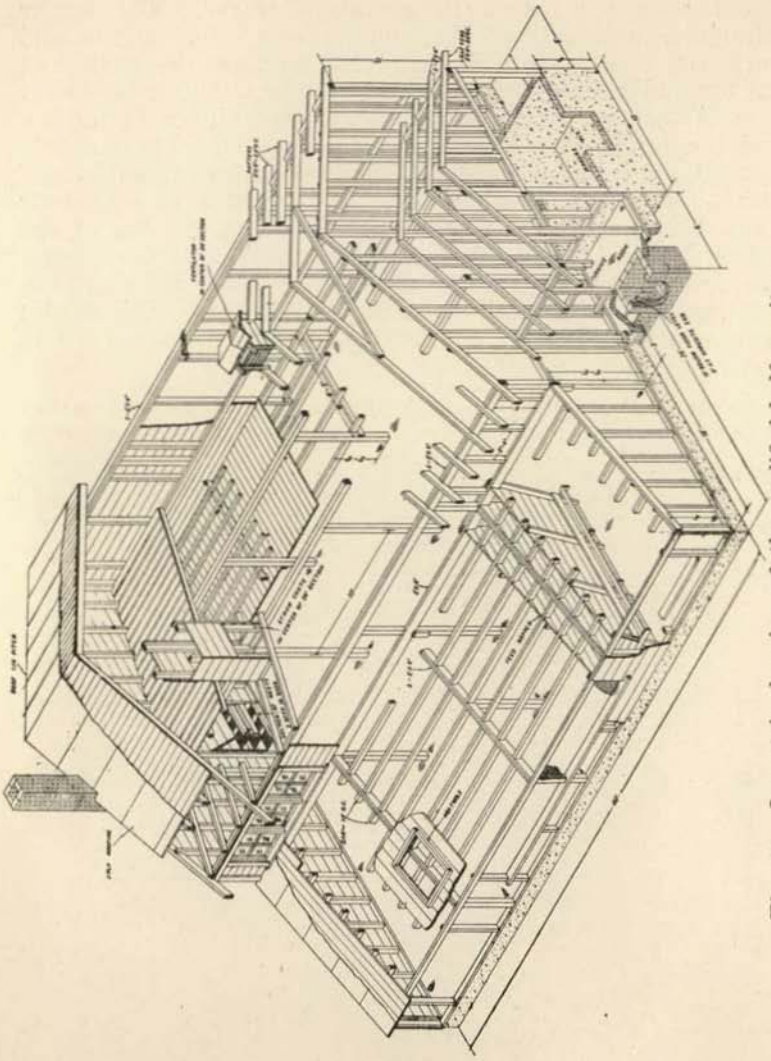

Fig. 11. Isometric drawing of the modified half monitor.

a litter carrier is not installed. If this is done the center section of the concrete floor should be at least six inches thick in order to withstand the weight of the team and wagon. The doors should be provided with close fitting weather strips and must be well constructed and carefully installed to prevent undue drafts.

Conveniences: In the half-monitor laying house large feed hoppers conveniently located for filling through a door in the roof are provided in the front of the house. Where this construction is used the yard gates should be arranged to permit ready access of the feed wagon to the hoppers. The detail for the construction of the large feed hopper is shown in figure 5. The construction of the small feed hoppers used in the gable-roof straw loft house is shown in figure 12. Other conveniences recommended are litter carriers either commercial or home made as shown in figure 13, and water under pressure in permanent troughs, which may be equipped with overflow drains, automatic supply valves and artificial heating devices.

The manure pit which is shown on the plans of the two larger houses provides a convenient place for litter accumulation.

Lighting Equipment

In Idaho the greatest number of eggs are produced during the months of April and May at a time when the hours of natural light and favorable climatic conditions provide the year's longest working days for the hen. During the winter months artificial lighting may be used to lengthen the days to about twelve hours, in an endeavor to increase egg production during the period when eggs are highest in price.

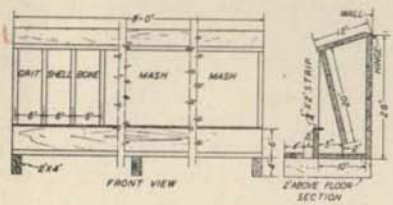

Fig 12. Feed hopper used in the gable roof straw loft laying house.

Amount of Light: The recommendation for lighting equipment and its installation has varied greatly in the past. When electricity is used a minimum of 40 to 50 watts has been recommended for 200 feet of floor area. This practice has secured fair results; however, the present tendency is to recommend the use of larger lamps for the same floor area. The use of a 100 watt lamp and a steel enamel reflector designed

for a 60-watt lamp, figure 14, gives a combination that places the lamp bulb far enough below the rim of the reflector to allow the light to spread into the far corners of the house. The use of the higher wattage lamps produces more than double the intensity of light due to the higher efficiency of the large lamps and means that the cost of operation is less in proportion to the amount of light secured. Tests show that reflectors concentrate the light to the floor area where it is most effective and that the use of the standard commercial equipment, known as the RLM Dome Reflector, is a paying investment.

Wiring: In making the lighting installation the first consideration is the source of the electric current. For the individual farm plant the 40 to 50-watt lamps are most desirable. From the central station service the larger lamps provide more illumination with a negligible increase in operating cost. The size of wires and the type of wiring used depend upon the number of lights and the voltage, or source of the current Consult your power company or light plant dealer regarding the transformer capacity or light plant size and be sure that your wireman installs a distribution system that will permit expansion and you will avoid the chief cause of difficulty in the use of electricity—that of having inadequate conductors for your main feeders and of overloading your source of supply, which means poor voltage regulation and unsatisfactory operation of your lights or other electrical equipment. The wiring equipment recommended for the poultry house circuits is either the knob and tube or the armored cable type. The type of wiring depends largely upon the value and permanence of the building in which the installation is made. The knob and tube system of wiring usually costs less for materials than the armored cable; however, installation costs are likely to make up for this difference.

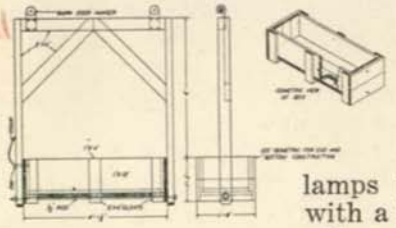

Fig. 13. Home-made litter carrier.

Location of Lighting Unit: The lamp and reflector unit may be hung six and one half feet from the floor or sufficiently high to clear the workman's head, and for the

twenty-four foot house located midway between the front of the house and the droppings boards. In the thirty-six foot house two rows of lights are recommended as shown in figure 15. Some poultrymen prefer to have their lighting units hung about four and one half feet from the floor in order that a little greater light intensity may be secured on the litter and feed. The lower the lights are hung the more chance there is for the birds to strike them when flying from the roosts and it is slightly more difficult to secure a spread of the light to the corners and perches. The shadows thus produced in the corners and along the walls by posts and feed bunkers are likely to result in groups of lazy birds, who prefer sleeping in the shadows to scratching in the litter. The switches and other equipment for controlling the light depend upon the lighting practice followed.

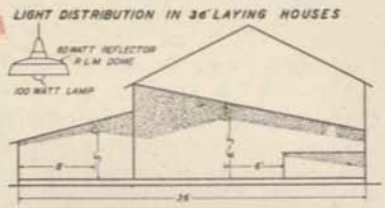

Fig. 14. Light distribution in the thirty-six foot laying house.

Lighting Schedule: Lighting in the morning is one of the simplest and most common practices. The lighting schedule is started early in the fall and each day the use of the light extended to meet the decrease in natural daylight. The switch controlling the light circuit may be operated by means of an alarm clock or the feed wires arranged to permit the location of the switch in the poultryman's sleeping quarters or wherever it will be most convenient. Night feeding of grain is usually practiced with the early morning lighting. The disadvantage of this method lies in the fact that the birds are awakened and brought down from the roosts into the cold house.

With morning and evening lighting it becomes necessary to provide some means of dimming the lights for the evening turnoff in order that the birds may find the roosts without confusion. This may be accomplished by means of a resistance or the use of a parallel series circuit either of which decreases the intensity of illumination by reducing the voltage or pressure at which the electrical energy is supplied to the lamps. The circuit connections for the parallel series method of dimming are shown in figure 15. Evening lighting alone has the advantage of a warmer

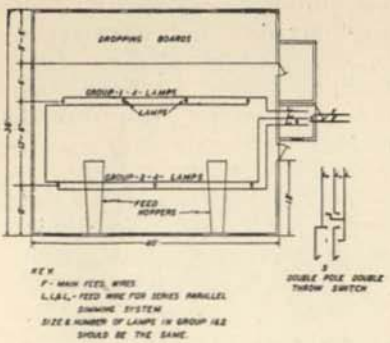

Fig 15. Suggested lighting arrangement and series parallel method of dimming lights in the thirty-six foot laying house.

house for the greater part of the bird's activity. The disadvantage is that it usually does not fit into the poultrymen's schedule quite as well as the morning or the twice-a-day method. The evening lunch system uses the least amount of light; however, it involves night work and the use of a dimming control.

Regardless of the practice of lighting followed, it should be remembered that the use of the light is for the purpose of bringing the birds off of their roosts and increasing the length of their active day. The results obtained from the use of artificial light for controlling the time of the egg producing period of the hen depend largely upon the living conditions, feeding, and management. In the use of any method of poultry lighting it is very important that any change in the schedule for lengthening or reducing the active period of the bird be limited to not more than fifteen minutes each day. If absolute regularity and consistency are not practiced in the use of lights the endeavor becomes a dangerous experiment instead of a benefit. Poultrymen who regulate their lighting schedules according to the body weight and general physical condition of their flocks have had greater success than those who depend upon a season or clock schedule. In general light should not be used on breeding pens until after the birds have had a suitable rest between their regular production periods.

Wiring and Lighting the Gable Roof Straw Loft Laying House: The entrance wires should enter the house preferably at the furnace room in order to provide an outlet for that room with the least amount of wiring material. The entrance wires must be located at least eight feet above the ground to avoid interference of wagons, etc., and placed in a position which will allow the opening or closing of the loft door.

An approved water-proof conduit bushing should be used for the entrance wires which are led to a junction box

through conduit pipe, where they can be divided into two circuits, one to the furnace room light and the other to the double pole control switch for the lighting of the house proper. The circuit from the control switch to the lights is shown in the diagram of the circuits, figure 16. Dimming of the lights may be secured through use of the series parallel method, using a double pole double throw switch. Dimming is secured by operating the lights in series. The circuits from the double pole double throw switch may be completed by the use of a triple conductor flexible armored cable and suitable iron outlet boxes, drop cords being used with keyless sockets to complete the circuit.

The cable may be supported by the use of metal clamps or holders nailed or screwed into the supporting member. Two 100 watt lights are recommended for this particular house, placed at a height of four and one-half to six and one-half feet above the floor and midway between the outer edge of the droppings boards and the opposite wall.

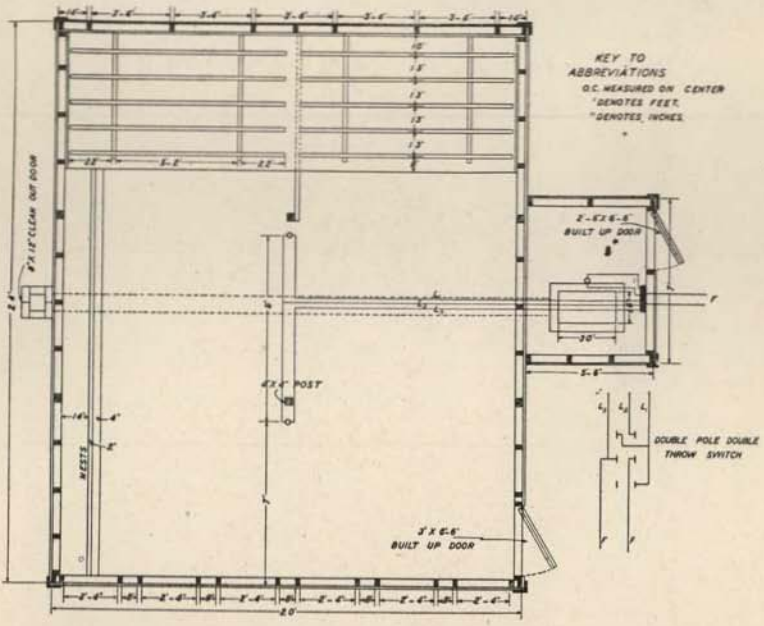

Fig. 16. Floor plan and wiring diagram for the gable roof straw loft laying house.

The distance between lights should be seven feet for this particular installation. The use of a 12 inch R. L. M. type reflector will give a very satisfactory light distribution to the floor and roosts.

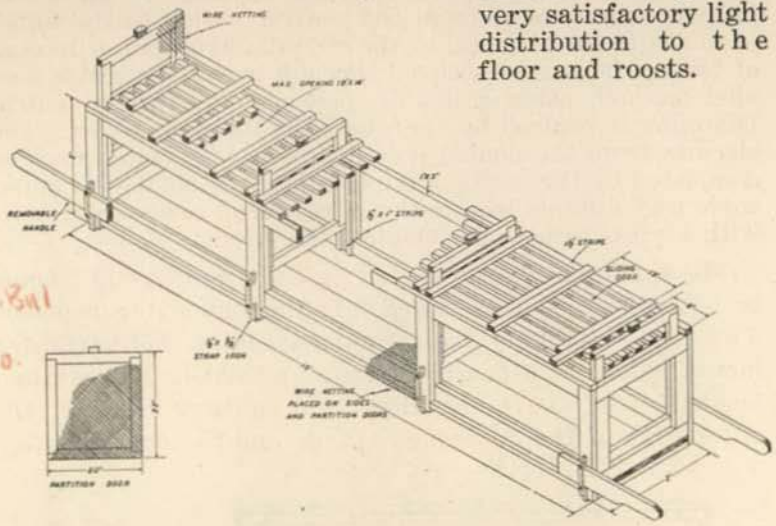

Fig. 17. Isometric drawing of the catching coop.

Bill of Material for Wiring the Gable Roof Straw Loft Laying House

One double pole control switch.
*One double pole double throw switch.
Two 12" R. L. M. Dome Reflectors.
Two 100 watt inside frosted lamps.
One 40 watt inside frosted lamp.
One dozen boxes connectors.
Two dozen BX clamps.
Thirty feet of 3 wire flexible armored cable.
Twenty-five feet extension cord.
Three complete drop cord outlet boxes.
One standard socket.
Two keyless sockets.
Ten feet of conduit.
One condulet entrance bushing.
Twenty-five feet of 2 conductor armored cable.
One iron junction box.

Half Monitor Laying House 36' x 40'
Plan Serial No. P.H.1., P.H.1A.

Bill of Materials

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
16	12'	2x6	16	12'	rafters
16	14'	2x6	16	14'	rafters
8	12'	2x6	8	12'	rafters
64	10'	2x4	64	10'	purlins
36	10'	2x4	36	10'	purlins
8	20'	2x4	8	20'	plates
4	18'	2x4	4	18'	sills
4	20'	2x4	4	20'	sills
1	10'	2x4	2	4'11"	end studs
1	12'	2x4	2	5' 4"	end studs
1	12'	2x4	2	5'10"	end studs
1	14'	2x4	2	6' 2"	end studs
1	14'	2x4	2	6' 7"	end studs
1	16'	2x4	2	7' 2"	end studs
1	16'	2x4	2	7' 7"	end studs
1	16'	2x4	2	8'	end studs

* The double pole double throw switch may be operated manually or by a system of alarm clocks or automatic time clocks. The switching apparatus should be enclosed in a metal or wooden box.

MATERIAL AS BOUGHT			MATERIAL AS USED		
No of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
1	18′	2x4	2	8′ 6″	end studs
1	18′	2x4	2	8′10″	end studs
2	10′	2x4	2	9′ 3″	end studs
2	10′	2x4	2	9′ 9″	end studs
1	14′	2x4	2	6′ 2″	end studs
1	12′	2x4	2	5′ 8″	end studs
1	12′	2x4	2	5′ 4″	end studs
1	10′	2x4	2	4′ 8″	end studs
1	10′	2x4	2	4′ 3″	end studs
1	8′	2x4	2	3′10″	end studs
5	8′	2x4	10	4′	side studs
7	10′	2x4	14	5′	side studs
6	20′	2x4	6	20′	droppings boards supports
5	10′	2x4	5	8′ 1″	droppings boards supports
8	8′	2x4	8	7′ 8″	perch supports
28	10′	2x2	28	8′ 4″	perches
5	8′	4x4	5	6′ 3″	posts
3	8′	4x4	3	7′11″	posts
5	10′	4x4	5	10′	posts
1	10′	4x4	1	4′ 9″	post
1	12′	4x4	3	4′	post
2	14′	2x4	8	3′ 4″	window frames
4	10′	2x4	16	2′ 2″	window frames
2	14′	2x6	8	3′ 4″	window sills
4	16′	1x4	odd		frames
2	18′	2x6	2	16′ 4″	rafters (furnace room)
6	12′	2x4	12	5′ 8″	purlins (furnace room)
4	10′	2x4	4	9′ 6″	studs (furnace room)
1	12′	2x4	2	5′ 9″	studs (furnace room)
1	8′	2x4	1	8′	stud (furnace room)
1	10′	2x4	1	8′ 3″	stud (furnace room)
1	10′	2x4	1	8′ 8″	stud (furnace room)
1	14′	4x4	odd		post (furnace room)

Summary

No. of Pieces	Length	Size of Stock	Material	Board Feet
28	10′	2x2	No. 1 common fir	94
15	8′	2x4	No. 1 common fir	80
129	10′	2x4	No. 1 common fir	860
11	12′	2x4	No. 1 common fir	88
5	14′	2x4	No. 1 common fir	47
3	16′	2x4	No. 1 common fir	32
6	18′	2x4	No. 1 common fir	72
18	20′	2x4	No. 1 common fir	240
24	12′	2x6	No. 1 common fir	288
18	14′	2x6	No. 1 common fir	252
2	18′	2x6	No. 1 common fir	36
8	8′	4x4	No. 1 common fir	86
6	10′	4x4	No. 1 common fir	82
1	12′	4x4	No. 1 common fir	16
1	14′	4x4	No. 1 common fir	19
4	16′	1x4	No. 1 common fir	23
				2315
		1x4	No. 1 common flooring	388
		1x6	No. 1 common ceiling	480
		1x8	No. 1 common shiplap	2700
		1x4	No. 1 pine trim	200
		1x6	No. 1 siding, common rustic	1200
				4968
			Total of lumber	7283

Miscellaneous

23 cubic yards of gravel
138 sacks of cement—1:2:4 mix
45 cubic yards of gravel or crushed stone under floor
17 rolls of 3 ply roofing
12 - 12″x14″ 4 light barn sash
8 - 12″x12″ 3 light barn sash
1 - 8″x10″ 4 light barn sash
3 - rim lock door sets
20 - ¾″x10″ drift pins
10 - ¾″x10″ bolts with nuts and washers
10 yards of muslin, 2 feet wide
10 yards of ¼″ hardware cloth, 2 feet wide
30 pounds 16d nails
100 pounds 8 d nails

21 pairs, 3" steel butt, tight pin hinges
7 pairs, 6" steel strap hinges
12 hooks and screw eyes
20 feet 8 gauge light coil chain

Note: This bill of materials (and bills following) does not include any interior equipment except the roosts and droppings boards. 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.

Modified Half-Monitor Straw Loft Laying House 36'x40' Plan Serial No. P.H.2, P.H2A.

Bill of Materials

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
42	16'	2x6	42	15'	rafters
9	12'	2x4	9	12'	collar beams
21	10'	2x4	21	10'	rafters (straw loft)
21	16'	2x4	21	16'	rafters (straw loft)
4	20'	2x4	4	20'	plates
4	20'	2x6	4	20'	plates
4	18'	2x4	4	18'	sills
4	20'	2x4	4	20'	sills
2	12'	2x4	2	10'11"	end studs
4	12'	2x4	4	11' 6"	end studs
4	14'	2x4	4	12' 6"	end studs
4	14'	2x4	4	13' 6"	end studs
4	16'	2x4	4	14'10"	end studs
4	16'	2x4	4	15' 8"	end studs
2	10'	2x4	2	8' 4"	end studs
1	12'	2x4	2	6'	end studs
1	12'	2x4	2	5' 7"	end studs
1	10'	2x4	2	5'	end studs
1	10'	2x4	2	4' 8"	end studs
1	10'	2x4	2	4' 3"	end studs
1	8'	2x4	2	4'	end studs
14	10'	2x4	14	10'	side studs
5	8'	2x4	10	4'	side studs
2	20'	2x4	2	20'	purlin plates
2	20'	2x8	2	20'	purlin plates
8	12'	2x6	8	11' 9"	rafters
32	10'	2x4	32	9' 8"	rafters
3	14'	4x4	5	6' 6"	posts

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
			1	7' 6"	pit post
5	10'	4x4	5	8' 2"	posts
5	10'	4x4	5	9'10"	posts
1	16'	4x4	1	4'10"	post
			3	3' 6"	posts
4	20'	4x4	4	20	beams (support straw loft)
8	20'	2x4	8	20'	droppings board support
5	10'	2x4	5	8' 5"	droppings board support
4	16'	2x4	8	7' 8"	perch supports
14	18'	2x2	28	8' 8"	perches
4	12'	2x4	16	3'	window frames
2	12'	2x2	odd		Ventilator frame
1	16'	2x6	1	16'	window sill
2	16'	2x6	8	4'	window sills
4	10'	2x6	4	8' 5"	window sills
1	14'	2x6	2	7'	window sills
1	12'	2x4	3	3'10"	door frame
2	12'	2x4	4	5' 8"	straw chute frame
2	10'	2x4	4	4' 4"	straw chute frame
2	10'	1x6	10	2"	straw chute frame
8	12'	2x4	8	10' 5"	rafters (furnace room)
5	14'	2x4	10	7'	studding (furnace room)
1	18'	2x4	3	6'	sill (furnace room)
2	16"	2x4	2	16'	collar beam
1	12'	2x4	2	6'	plates
1	8'	4x4	1	7'	post

Summary

No. of Pieces	Length	Size of Stock	Material	Board Feet
2	12'	2x2	No. 1 common fir	8
14	18'	2x2	No. 1 common fir	84
6	8'	2x4	No. 1 common fir	32
78	10'	2x4	No. 1 common fir	520
33	12'	2x4	No. 1 common fir	264
13	14'	2x4	No. 1 common fir	122
35	16'	2x4	No. 1 common fir	374
5	18'	2x4	No. 1 common fir	60

No. of Pieces	Length	Size of Stock	Material	Board Feet
18	20′	2x4	No. 1 common fir	240
4	10′	2x6	No. 1 common fir	40
8	12′	2x6	No. 1 common fir	96
1	14′	2x6	No. 1 common fir	14
45	16′	2x6	No. 1 common fir	720
4	20′	2x6	No. 1 common fir	80
2	20′	2x8	No. 1 common fir	54
1	8′	4x4	No. 1 common fir	11
10	10′	4x4	No. 1 common fir	137
3	14′	4x4	No. 1 common fir	56
1	16′	4x4	No. 1 common fir	22
4	20′	4x4	No. 1 common fir	107
2	10′	1x6	No. 1 common fir	10
				3051
		1x4	No 1 common flooring	400
		1x8	No. 1 common shiplap	3800
		1x4	No. 1 common pine trim	200
		1x6	No. 1 common pine (straw loft)	740
				5140
			Total of lumber	8191

Miscellaneous

23 cubic yards of gravel
138 sacks of cement
45 cubic yards of gravel or crushed stone under floor
19 rolls of 3 ply composition roofing
13 - 12″x14″ 4 light barn sash
8 12″ x 12″ 3 light barn sash
1 - 8″x10″ 4 light barn sash
3 rim lock door sets
20 - ¾″x10″ drift pins
10 - ¾″x10″ bolts with nuts and washers
10 yards of muslin, 2 feet wide
10 yards of ¼″ hardware cloth, 2 feet wide
30 pounds 16 d nails
100 pound 8 d nails

GABLE ROOF STRAW LOFT LAYING HOUSE 20′ x 24′
PLAN SERIAL NO. P.H3, P.H. 3A

Bill of Materials

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
22	16′	2x6	22	15′	rafters
4	12′	2x4	4	12″	collar beams
11	12′	2x4	11	12′	rafters (straw loft)
11	14′	2x4	11	14′	rafters (straw loft)
4	20′	2x4	4	20′	plates
2	20	2x4	2	20′	sills
4	12′	2x4	4	12′	sills
1	20′	2x4	1	20′	purlin
4	12′	2x4	4	10′ 8″	end studs
4	12′	2x4	4	11′ 6″	end studs
4	14′	2x4	4	12′ 6″	end studs
4	14′	2x4	4	13′ 6″	end studs
4	16′	2x4	4	14′10″	end studs
4	16′	2x4	4	15′ 8″	end studs
2	10′	2x4	2	8′ 4″	end studs
22	10′	2x4	22	10′	side studs
1	20′	4x4	3	6′ 5″	posts (support straw loft)
3	10′	4x4	3	8′ 2″	posts (support straw loft)
2	20′	4x4	2	20′	beams (support straw loft)
3	20′	2x4	3	20′	droppings board support
2	12′	2x4	4	5′ 5″	perch supports
10	10′	2x2	10	9′ 1″	perches
1	10′	2x4	1	8′ 5″	droppings board support
5	14′	2x4	10	7′	studs (for furnace room)
1	18′	2x4	1	7′	plate (for furnace room)
		2x4	1	5′ 6″	plate (for furnace room)
		2x4	1	5′ 6″	plate (for furnace room)

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
1	18′	2x4	1	7′	sill
		2x4	1	5′ 6″	sill
		2x4	1	5′ 6″	sill
3	12′	2x4	6	5′ 5″	rafters
1	12′	2x2	odd		ventilator frame
3	18′	2x2	odd		muslin frames
1	14′	2x6	odd		window sills
1	18′	2x6	odd		window sills

Summary

No. of Pieces	Length	Size of Stock	Material	Board Feet
10	10′	2x2	No. 1 common fir	34
1	12′	2x2	No. 1 common fir	4
3	18′	2x2	No. 1 common fir	18
25	10′	2x4	No. 1 common fir	167
32	12′	2x4	No. 1 common fir	256
24	14′	2x4	No. 1 common fir	224
8	16′	2x4	No. 1 common fir	86
2	18′	2x4	No. 1 common fir	24
10	20′	2x4	No. 1 common fir	134
1	14′	2x6	No. 1 common fir	14
22	16′	2x6	No. 1 common fir	352
1	18′	2x6	No. 1 common fir	18
3	10′	4x4	No. 1 common fir	41
3	20′	4x4	No. 1 common fir	80
				1452
		1x4	No. 1 common flooring	150
		1x8	No. 1 common shiplap	1380
		1x6	No. 1 common fir trim	305
		1x6	No. 1 common pine	360
				2195
			Total of lumber	3647

Miscellaneous

8 cubic yards of gravel
48 sacks of cement
16 cubic yards of gravel or crushed stone under floor
7 rolls of 3 ply composition roofing
8 - 12″x14″ 4 light barn sash
5 - 12″x12″ 3 light barn sash

2 - 8"x10" 4 light barn sash
2 rim lock door sets
6 - ¾"x10" drift pins
10 - ¾"x10" bolts with nuts and washers
2 yards of muslin, 24" wide
40 pounds of 8 d nails
15 pounds of 10 d nails
10 pounds of 16 d nails
15 pairs of 3" butt hinges
3 pairs of 6" strap hinges

Bill of Materials for Equipment Used in the Laying Houses

Nests

Plan Serial No. P.H.5

No. of Pieces	Length	Size of Stock	Material	Board Feet
16	12′	1x8	No. 1 shiplap	128
9	16′	1x8	No. 1 shiplap	96
2	12′	1x12	No. 1 common	24
8	12′	1x4	No. 1 common	32
12	16′	1x4	No. 1 common	64
1	10′	1x3	No. 1 common	3
			Total of lumber	347

9 pairs 8" steel T hinges
48 feet ¼" mesh hardware cloth, 24" wide

Furnace, Flue and Stack

Plan Serial No. P.H.6

1600 bricks
2 barrels of lime
1¼ yards of sand
1 cast iron furnace cover
20 cast iron flue covers
2 yards of sand and gravel for footing for stack and flue
12 sacks of cement

Feed Hoppers

Plan Serial No. P.H.7

No. of Pieces	Length	Size of Stock	Material	Board Feet
4	14′	2x4	No. 1 common	38
2	12′	2x4	No. 1 common	16
2	10′	2x4	No. 1 common	14
2	8′	2x4	No. 1 common	11
		1x6	No. 1 shiplap	450
4	12′	1x6	No. 1 common	24
4	12′	1x4	No. 1 common	16
4	12′	½x2	clear	4
			Total of lumber	573

BILL OF MATERIALS FOR EQUIPMENT USED IN THE GABLE-ROOF MODIFIED STRAW LOFT LAYING HOUSE

Nests

Plan Serial No. P.H.5

No. of Pieces	Length	Size of Stock	Material	Board Feet
9	16′	1x8	No. 1 shiplap	96
6	16′	1x4	No. 1 common fir	32
1	12′	1x12	No. 1 common fir	12
4	10′	1x4	No. 1 common fir	14
1	8′	1x3	No. 1 common fir	2
			Total of lumber	156

6 pairs 8″ steel T hinges
24 feet ¼″ mesh hardware cloth, 24″ wide

Feed Hopper

Plan Serial No. P.H.8

No. of Pieces	Length	Size of Stock	Material	Board Feet
1	14′	1x10	No. 1 common fir	12
1	14′	1x6	No. 1 common fir	7
1	14′	1x12	No. 1 common fir	14
1	14′	1x4	No. 1 common fir	5
1	14′	¼x2	No. 1 common fir	2
7	14′	1x8	No. 1 shiplap	66
1	16′	1x10	No. 1 common fir	14
1	8′	2x4	No. 1 common fir	6
			Total of lumber	126

4 pairs 3″ steel butt hinges

Bill of Materials for Labor-Saving Equipment

Catching Coop

Plan Serial No. P.H.10A

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
2	10′	1x12	2	10′	Floor
2	14′	1x4	2	13′	handles
8	10′	1x1½	8	10′	top slats
2	16′	1x1½	16	2′	supports
1	8′	1x1½	6	1′ 4″	sliding doors
4	10′	1x3	4	10′	side rails
1	10′	1x3	8	1′ 4″	bridging
2	16′	1x3	8	2′	uprights
2	16′	1x3	8	1′10″	door frames
2	14′	1x3	8	1′ 8″	door frames

Miscellaneous

25 feet ¼″ wire netting, 2 feet wide
14 feet ⅛″ strap iron
5 pounds 8d nails

Note: Cedar makes a very desirable wood for the construction of the catching coop.

Litter Carrier

Plan Serial No. P. H. 14

Bill of Materials

MATERIAL AS BOUGHT			MATERIAL AS USED		
No. of Pieces	Length	Size of Stock	No. of Pieces	Length	Use made of piece
1	16′	2x4	2	5′ 3″	Box hanger
			1	4′ 6″	Cross piece
1	12′	2x4	2	3′	Diagonal braces
			3	1′ 6″	Bottom cleats
1	8′	1x12	2	4′	Sides
22 F.B.M.		Shiplap 1x8			Bottom and ends
5	10′	2x4	5	10′	Track support
5	10′	2x4	25	1′ 3″	Track hangers

Miscellaneous

1 - ½″x4″ pin bolt and one foot of chain.
2 door hangers with bolts.
1 - ½″x4′ 8″ rod for box with nuts and washers.
50′ barn door track.

The following list of poultry house and equipment plans may be secured in blue print form.

The first letter and numeral indicate the series and file number and refers to drawings which include floor plans, and end and side elevations. The letter following the serial number denotes an isometric drawing which gives considerable additional detail of the framing and general construction.

Blue Print Price List

Poultry Husbandry Series—P.H.

Serial Number	Cost Each	Subject and Description
P.H. 1	30c	Working drawing of half-monitor laying house 36′ x 46′ recommended for 375 to 400 chickens. May be adapted to 36′ x 50′ for 450 to 500 chickens. Bill of material included.
P.H. 1A	30c	Pictorial drawing of P.H. 1
P.H. 2	30c	Working drawing of modified half-monitor straw loft laying house 36′ x 40′ recommended for 375 to 400 chickens. May be adapted to 36′ x 50′ for 450 to 500 chickens. Bill of material included.
P.H. 2A	30c	Pictorial drawing of P.H. 2
P.H. 3	30c	Working drawing of gable roof straw loft laying house 20′ x 24′ recommended for 120 to 140 chickens. May be adapted to 24′ x 24′ for 150 to 165 chickens. Bill of material included.
P.H. 3A	30c	Pictorial drawing of P.H. 3.
P.H. 4	30c	Under heat type furnace brooder house with flue details. Bill of material included.
P.H. 5	15c	Nests—double deck nests recommended for laying houses. Bill of material included.
P.H. 6	15c	Furnace—under heat type adapted to laying houses. Bill of material included.
P.H. 7	15c	Feed hopper—adapted to P.H. 1 and P.H. 2 laying houses. Bill of material included.
P.H. 8	15c	Feed hopper adapted to P.H. 3 laying house. Bill of material included.
P.H. 9	15c	Mash hopper—portable range hopper. Bill of material included.

Serial Number	Cost Each	Subject and Description
P.H. 10a	15c	Catching coop designed to save labor when handling a large number of birds. Bill of material included.
P.H. 11	15c	Suggested lighting arrangement, and series parallel method of dimming lights in poultry houses having a 36′ x 40′ floor.
P.H. 12	15c	Diagram showing light distribution suggested in 36′ x 40′ houses when lighting arrangement in P.H. 11 is used.
P.H. 13	25c	10′ x 12′ portable colony house showing details and separate skids for moving small buildings not already on skids.
P.H. 14	25c	Litter carrier. Designed to be used in P.H. 1 and P.H. 2.

The prices listed include postage for distribution within the state of Idaho. For all blue print service furnished outside of Idaho add 70 cents per set. Address all correspondence to the Department of Agricultural Engineering, University of Idaho, Moscow, Idaho.