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Housing Farm Poultry

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

POULTRY SECTION

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Housing Farm Poultry

By

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A GOOD LAYING HOUSE is one of the most important features of a well-planned poultry enterprise. It should provide the necessary comfort for the layers and afford convenience for the operator. The essential points to be considered are: (1) protection from extreme heat, cold, or sudden changes in temperatures; (2) freedom from drafts; (3) sufficient ventilation to promote dryness; (4) window openings to admit an abundance of light and sunshine; (5) control of sanitation and parasites; (6) sufficient floor space; (7) convenience in routine management; (8) protection against rodents; (9) economical construction; and (10) durability.

Protection from Weather Extremes and Sudden Changes

Comfort for the layers becomes increasingly important as greater egg production is expected. In many instances the drop in egg production following one or more cold spells constitutes a financial loss in a single year equivalent to the additional cost of building for adequate protection. Since Idaho is subject to both extremes, cold in winter and heat in summer, the laying house must be well built and insulated to protect the laying flock. Proper housing is, therefore, a matter of real economy.

Freedom from Drafts

A drafty house is one of the principal causes for colds in the laying flock.

This constitutes a special problem in those sections of the State where the prevailing winds are from the southwest and southeast. For this reason houses should be built deep from front to back, solid partitions added when necessary to stop the lengthwise drafts, and window openings adjusted according to the wind velocity.

Ventilation

Sufficient ventilation to secure dryness is a major problem during the winter months. Laying houses are particularly difficult to venti-

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late during this period due to the excessive moisture given off by the birds in respiration and because there is not sufficient body heat to stimulate air circulation. Oftentimes the low temperatures are associated with high humidity in the outside air, which further complicates the problem of securing dry conditions inside the house. Ventilation without draft is based primarily upon a circulation of air caused by differences in temperature.

One of the basic features in ventilating a laying house is that of providing an outlet for the moist warm air at or near the highest point in the building. This feature applies to any size or type of house and is undoubtedly the most disregarded fundamental principle of ventilation. When no such outlet is provided, the damp air is trapped in the upper part of the house; and the moisture condenses on the ceiling, walls, and litter. In the straw loft house the air should diffuse up through the thinner layer near the front and through the straw chutes, while in the case of the half-monitor type, it should be allowed to escape through the partly opened monitor windows; in the shed roof type, openings should be provided near the front plates; and, in the various types of ceiled houses an outlet should be provided at the highest point. This principle is incorporated in the gable ceiling insulated laying house illustrated in Figure 7 and in the shed roof type in Figure 9.

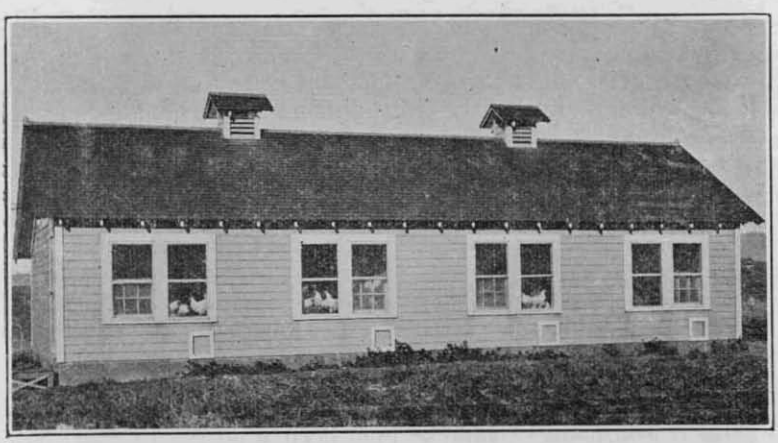

Fig. 1. The gable ceiling insulated laying house.

Flue systems of ventilation have not proved uniformly successful. A possible explanation is the fact that there has not been sufficient draft or "pull" in the outlet flue to create positive circulation. This is likely to be the case if the outlets are too small, too short, or insufficient in number. The outlet flue should function in much the same way as an ordinary chimney; the draft of either can be improved by increasing the length or diameter. Two features will aid in this ventilation problem—insulation of walls and ceiling and the use of some artificial heat.

Insulation—There has been a definite trend in recent years to insulate the ceiling and walls of the laying house. Insulation should be regarded as one of the fundamental requirements in securing positive ventilation during cold weather. An insulated ceiling is especially important in that it results in a warmer surface which reduces the tendency for moisture to condense and form frost; it also conserves the animal heat given off by the birds and thus causes a more positive circulation of air. Various insulation materials and methods of construction are being used at the present time. One of the cheapest types of insulation is that of sheeting the house on the inside of the studs and using shavings, cut straw, or similar material between the walls. Insulation necessarily adds to the initial cost but it reduces the need for artificial heat and, in general, its value is becoming more universally recognized.

Artificial heat—No system has yet been devised that adequately controls moisture to the extent desired in winter except by the use of some artificial heat. There are periods of extremely high atmospheric humidity when ordinary methods of ventilation may be inadequate. A small amount of heat will stimulate circulation and cause a drying effect in any type of house and with any system of ventilation. Too much heat is to be avoided as it has a tendency to devitalize the birds. The heat is for a drying effect rather than that of raising the temperature materially. There are various systems of heating which may be employed; namely, the underground furnace type, hot water piping systems, and brooder stoves, either in conjunction with the regular hover or within a galvanized metal jacket.

Low ceiling essential—Ceilings should be built as low as possible —just high enough to allow head room for the operator and to be consistent with the proper construction of the particular type selected. A low insulated ceiling conserves animal heat, resulting in a warmer house and improved ventilation during cold weather.

Light

Birds are naturally more active and feed better when the house is well lighted. The window arrangement should be such that light will be distributed to all parts of the house, and they should be of such number as to allow sufficient light even on cloudy days in winter. The plans illustrated provide for windows in the rear wall below the droppings boards to improve the light in the rear portion of the house. When the light is admitted from the front only, the hens scratch the litter to the rear of the house. Windows in the north wall tend to keep the litter more evenly distributed and provide cross ventilation during the summer months.

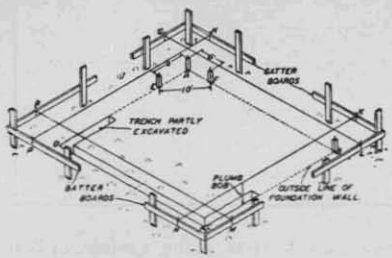

Fig. 2. A method of laying out foundations.

Direct Sunlight

The value of the ultra-violet rays of direct sunshine in promoting mineral assimilation and the resulting effects in improved egg production, hatchability of eggs, and the health of the hen, is quite generally understood (More detailed information is given in Idaho Extension Circular No. 44, *Poultry Rations and How to Mix Them*). Ordinary window glass does not admit the ultra-violet rays; consequently, windows should be so arranged and operated as to admit the maximum amount of direct sunlight into the house, especially during winter months.

Special window glass and various glass substitutes are on the market which admit a portion of the ultra-violet rays of direct sunshine. The efficiency of these products vary considerably and become lessened as they are covered with dirt and dust. The use of such products should not be considered a justification for not opening the windows on sunny days. Wire-bottomed sunyards in front of the house are used by some poultrymen as a means of securing greater benefit of direct sunshine.

Floor Space

The practice of overcrowding hens is a common fault which should be avoided. The floor space required varies with the breed,

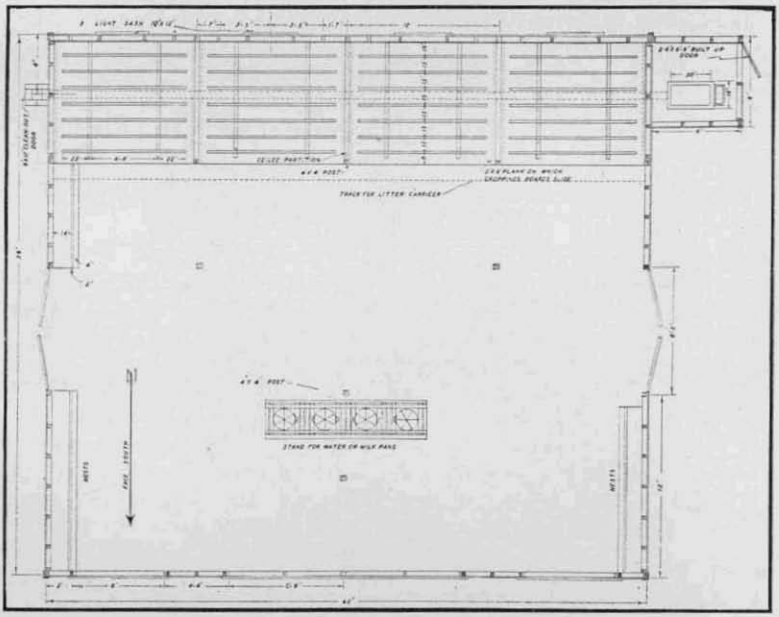

Fig. 3. Floor plan for modified straw loft half-monitor laying house.

the number of birds in a single unit, and the efficiency of the ventilation. Heavy breeds require 3½ to 4 square feet per bird, and leg-

horns, 3 to 3½ square feet per bird when housed in small units. Two and a half to three square feet per bird is a common practice in large flocks and with efficient ventilation.

Damp Litter

This is one of the major problems of poultry house management during cold weather. It is always associated with inadequate ventilation and overcrowding, and is sometimes the result of faulty floor construction. Board floors are extremely difficult to keep dry and are not generally recommended. To insure a dry cement floor, a fill of rock or gravel of at least ten inches under the concrete is advisable. The floor should always be at least a foot above the level of the ground outside. Improved ventilation as discussed in a previous section will always help to keep the litter dry. Clean dry straw should be available for litter throughout the season.

Sanitation

Modern houses provided with concrete floors and removable interior equipment facilitate cleaning and disinfecting and makes possible more effective sanitation. It is to be noted in the illustrations that all equipment is elevated above the floor and built so that it can be removed (See Idaho Extension Circular No. 49, *Prevention and Control of Poultry Diseases,* for details in cleaning and disinfecting the laying house).

Durability and Economy

A new poultry house should be planned as a permanent investment; as such, the cost of the house should be considered in relation to the productivity and the returns from the flock. Naturally, a greater investment is justified with a high-producing flock. Hens that give a consistent production of 50 to 60 per cent during the winter months require better housing conditions than poor-producing pullets. An inexpensive house that allows the temperature to drop in cold weather to the extent of reducing the egg production from 50 to 20 per cent for a period of several weeks cannot be considered a good investment. The problem, then, is one of providing the necessary protection as economically as possible. The actual cost varies considerably, depending upon the variation in the cost of materials in different localities and the extent to which hired labor is used. Good materials and proper construction insure durability and are more economical as an investment in the long run. A concrete floor may add some to the initial cost of construction but is more durable, more easily cleaned and disinfected, is rat proof, and is, therefore, recommended in preference to wood floors.

Convenience

Every convenience which tends to facilitate the management of the flock and reduce the routine labor should be provided. Large mash hoppers that are convenient to fill, droppings boards that are easily cleaned, and convenient nests are recommended. Litter carriers, supply bins for feed, and running water should be provided where possible. The careful manager will figure out many other

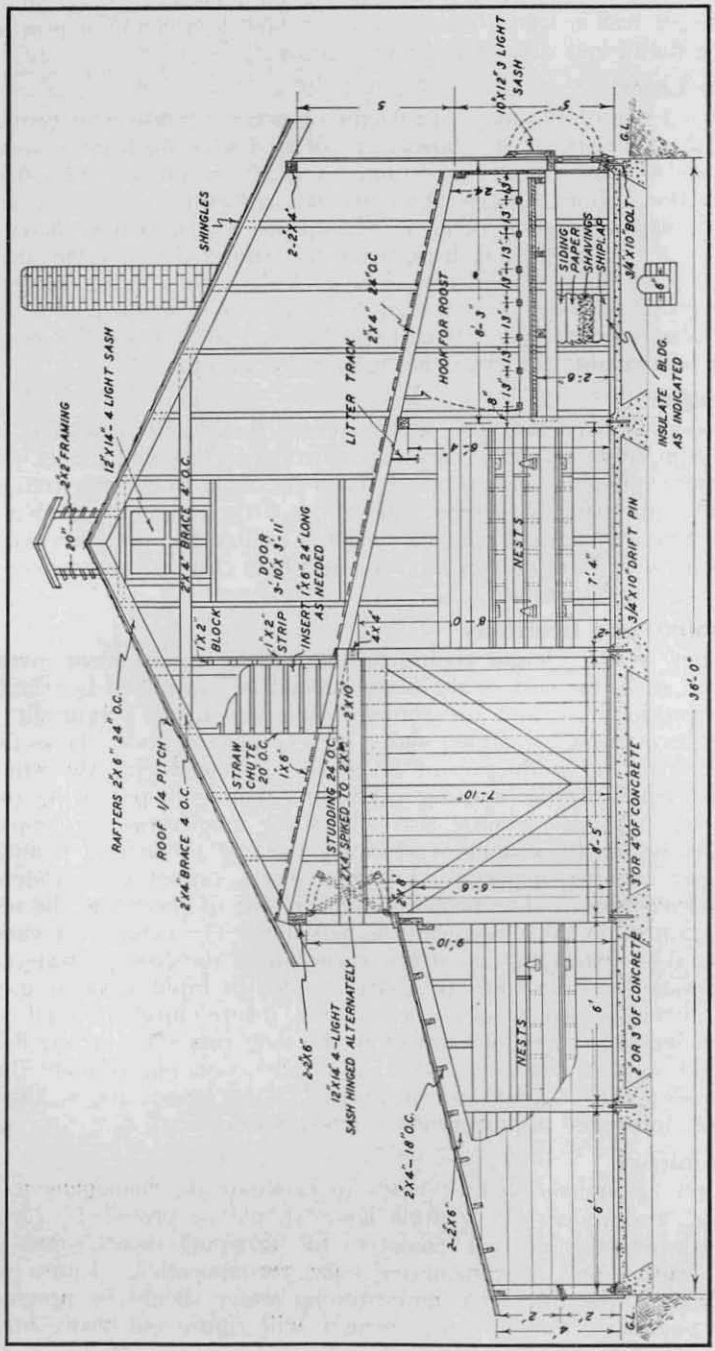

Fig 4. Framing section of straw loft half-monitor laying house.

matters of convenience that will apply to his own particular circumstances which will facilitate in the management of his flock.

TYPE OF HOUSE

Personal preference and type of enterprise—These factors will always influence the choice in the type of house. In some instances a certain type or style may be desired to fit in the general scheme of the other farm buildings. The question as to whether the flock is to be managed in one large unit, as for market egg production, or as several small units such as a breeding enterprise, will determine the pen arrangements which, in turn, will influence the type and depth of house. Whatever the type or style of structure, the essential features previously discussed should be incorporated.

Houses should be deep from front to back—Peculiarities of climatic conditions and the prevailing winds of Idaho previously mentioned make it necessary to build houses deep from front to back to avoid drafts and place the roosts as far back as possible from the front openings. A minimum depth of 24 feet is recommended where the size of the flock or unit will permit. For very small flocks the distance from the front to back should be greater than the distance from end to end. For example, a house 20 feet deep and 16 feet from end to end will make more satisfactory and comfortable con-

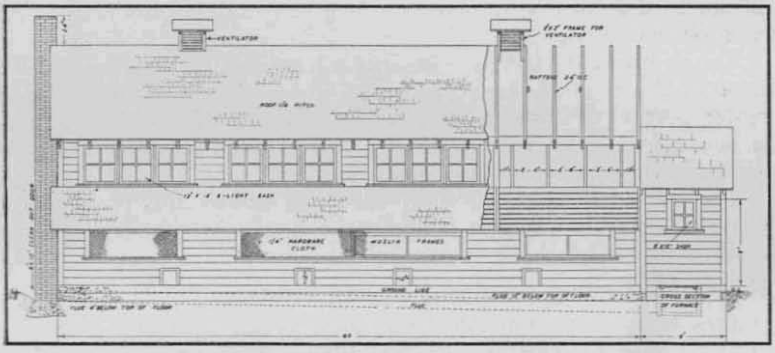

Fig. 5. Front elevation of straw loft half-monitor laying house.

ditions for a flock of 80 to 100 birds than if the dimensions were the other way.

Type of house influenced by the depth—As stated above, the type of house will be influenced by the depth of house and size of unit. For a house 36 feet deep the modified half-monitor straw loft type is illustrated, and for a 24-foot depth the combination type of roof with the gable ceiling. Small units, such as the back yard or town flocks, can usually be housed more satisfactorily with the shed roof type.

Modified Straw Loft Half-Monitor House

This type provides the possibility of a deep house, management

of the flock in large units, and includes a straw loft over the rear portion. The straw loft feature has several advantages, chief of which are convenient storage of straw to be used for litter during the winter, effective over-head insulation and improved ventilation.

The straw loft feature has been widely used in various sections of the United States and Canada, and can be incorporated in almost any type of house. In this particular type, it functions as part of the ventilating system by allowing the air to circulate through the thinner layer of straw and through the straw chutes which also serve as ventilating flues. Cupolas should be provided as illustrated so that the moist air can escape and thus make for more positive air circulation.

The features of the straw loft which might be considered as disadvantages are that it constitutes a rat harbor in those localities whe e rats are prevalent, and makes it more difficult to do a thorough job of disinfection following an outbreak of some contagious disease.

In some localities, insulation of the side walls may furnish sufficient protection during winter without the use of artificial heat. According to field observations, this house so insulated appears to provide ample protection without artificial heat when the outside temperature was as low as 25 degrees below zero; however, such results are obtained when the house is built according to specifications and operated according to instructions given in detail under the paragraph on operation.

The depth of 36 feet is a distinct advantage in reducing the likelihood of drafts and allows the fronts to be entirely open during the greater portion of time in winter. In general, the conditions inside the house do not fluctuate as readily with sudden changes in weather conditions as is the case with small houses.

The use of double doors on each end allows the possibility of driving a team and wagon through the house, which facilitates the handling of feed and the removal of the litter.

The Gable Ceiling Insulated Laying House

This house has been developed as a result of recent studies in poultry housing conducted at the Idaho Agricultural Experiment Station. The general plan, including the sloped ceiling, the size and length of the outlet flue, and the insulation of the walls and ceiling has been designed to facilitate the ventilation of a tightly ceiled house. Although the house is illustrated with a depth of 24 feet, the same type may be used to a depth of at least 30 feet. An additional feature of this house is that it provides a low ceiling but still allows sufficient head room for the operator. In longer units solid partitions should be used every 30 to 50 feet, depending upon the prevailing winds in a particular locality. The adjustable window openings allow flexibility in management, making it possible to have windows out entirely or closed except for ventilation requirements. The outlet flue is larger in diameter and has a greater length than is ordinarily usd in order to afford more positive "pull" or draft. A check dam-

per should be provided to partially close the flue and reduce the outlet during extremely cold or windy weather in winter.

In actual observations taken during winter weather it was found that this house maintained a minimum temperature of 24 to 26 degrees above zero while the outside temperature was 20 below. During this same period, a single boarded house near by allowed the temperature to go below zero inside the house.

The Shed Type House

This type is somewhat cheaper per bird due to the fact that less lumber is actually required per given area of floor space and it has the advantage of being more simplified in construction. It is not adapted to houses deeper than 20 feet as it becomes necessary to build the front too high in order to secure the additional depth. The high front associated with the shed type is less desirable in localities subjected to strong south winds. This style of roof sould be ceiled on the under side of the rafter to secure the necessary insulation to promote ventilation and to prevent moisture and frost from accumulating in winter. The flat roof of the shed type necessitates the use of composition roofing which often requires repairs after heavy winds and in localities with heavy snow fall it may be necessary to shovel the snow off to reduce the weight and keep it from sagging. In such localities it may be desirable to use a steeper pitch than is illustrated in Figure 9.

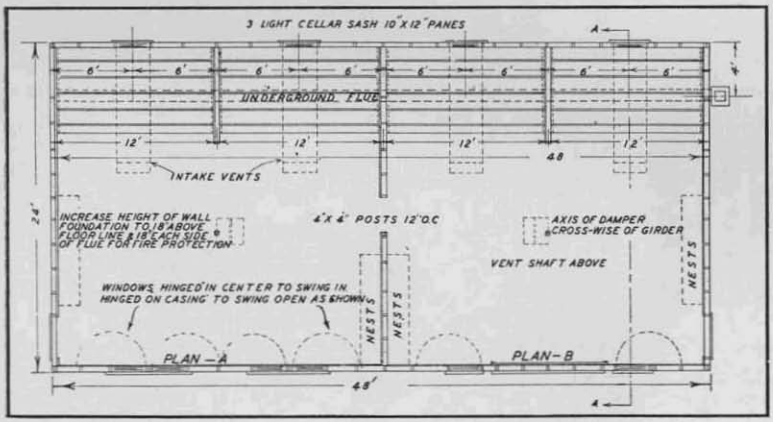

Fig. 6. Floor plan of the gable ceiling insulated house.

LOCATION

The laying house should be located on a site that will afford good drainage of both surface water and air. The convenience of the operator, yarding system, and the relation to other farm buildings and enterprises should be considered in the selection of the site. Protection from prevailing winds is desirable where possible if it does not exclude direct sunlight during the winter.

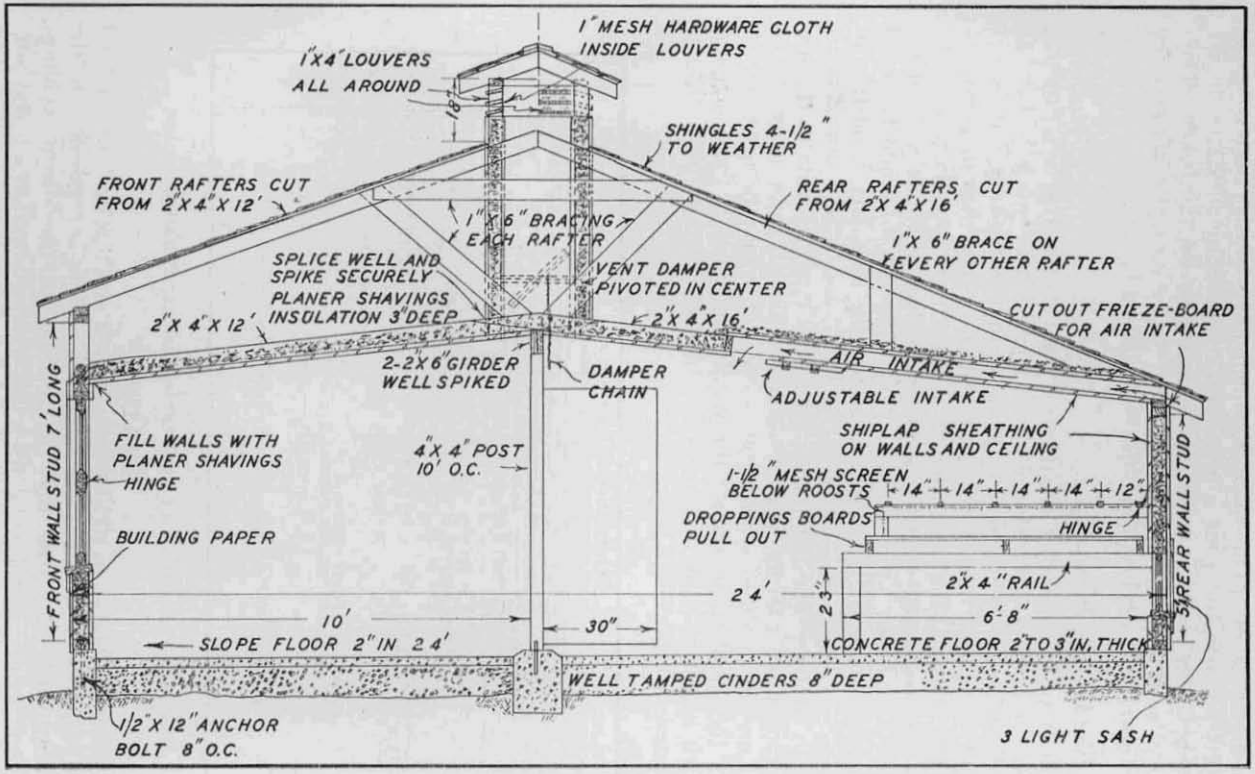

Fig. 7. Framing section of the gable ceiling insulated laying house.

CONSTRUCTION

Foundation and walls—The depth of the foundation will vary with the soil type and drainage. It should never be less than 12 inches above and 12 inches below the ground. The height of the foundation should be considered in relation to the floor level which should be about a foot above the ground. The building may be staked out by the right triangle method illustrated in Figure 2 which insures square corners by using a right triangle whose sides are 6x8x10. Where the gravel is reasonably coarse and the sand clean and sharp, a 1:2½:5 mix, using a maximum of 6 to 7 gallons of water to one sack of cement, should be used; if the sand is very fine, more cement will be needed; in this case a 1:2:3 mix will be desirable. Before the walls are finished the sill bolts should be put in place as indicated on the plans. The rocks in the mixture are spaded back from the form to insure a smooth wall.

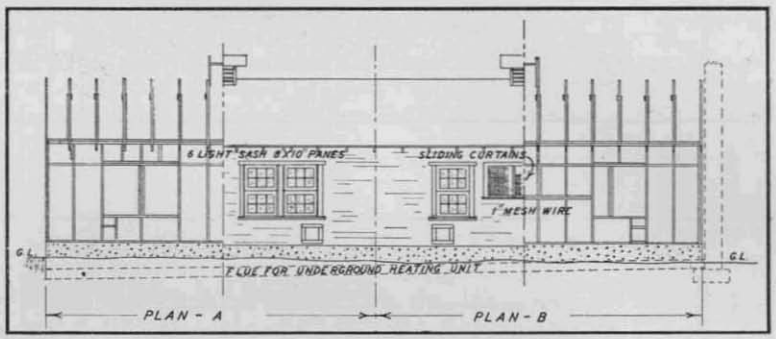

Fig. 8. Front elevation of the gable ceiling insulated laying house.

Floor—The thin floor suggested requires a well tamped fill of cinders, gravel, or crushed rock. This fill should be from 8 to 10 inches deep and sufficiently porous to stop moisture from coming through from the soil to the concrete. A floor 2 to 3 inches thick will be satisfactory providing a stiff 1:2:3 mix, consisting of 5½ gallons of water to each sack of cement, is used. After the floor has set for two or three hours it may be finished with a float to the desired smoothness. For convenient leveling it may be desirable to divide the floor into several strips running lengthwise with the building, depending upon whether hand or machine mixing is used, but should not be more than 10 to 15 feet in width. It is usually desirable to allow a slight slope in the floor toward the front (one inch to every 10 to 12 feet) to facilitate cleaning when water is used. To promote proper curing the concrete should be kept wet by covering it with sacks or similar material and keeping it moist for a week or ten days.

Framing—The usual type of frame construction for poultry houses consists of 2x4 sills bolted to the foundation and set with the outside edge flush with the foundation wall in order that the siding may be started one to two inches below the top of the concrete. The

purpose of this practice is to keep the sills dry, thus insuring a maximum length of life. When 2x4 studs are used, they should be spaced not more than two feet on centers and should be doubled at the corners, windows, and doors. The framing detail for the front wall will depend upon the type of window or panel openings selected.

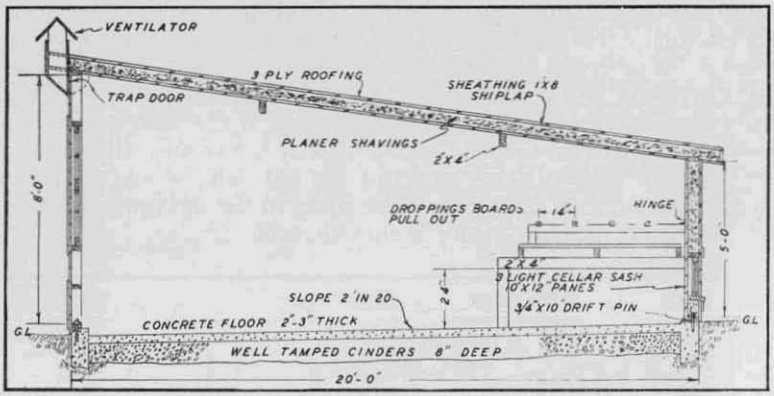

Fig. 9. Framing section of the shed roof laying house.

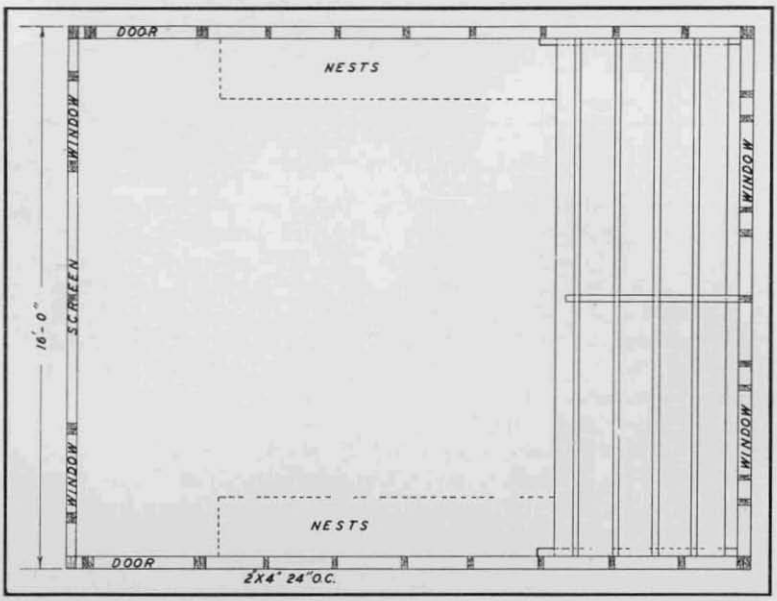

Fig. 10. Floor plan of the shed roof laying house.

The bracing required in the sidewall or end framing depends upon the number of openings required by the plan. The use of double plates

is recommended because this makes it possible to break the joints, thus tying the building together and adding to its rigidity. In constructing the framing it is important to keep the surface to which the siding or sheeting is nailed carefully aligned so that all joints may be fitted closely and nailed securely.

Roof—The roof rafters for the various poultry house plans are generally cut from 2x4 stock, spaced two feet on centers. In some cases these rafters are tied at the center by a collar beam and in the gable ceiling house a triangular brace is used. For roofs with less than a quarter pitch, it may be advisable to employ some type of prepared roofing, in which case the shiplap should be applied without spacing. Cedar shingles laid four and a half inches to the weather are recommended except for the shed roof type.

Windows—In general, the plans for the windows shown in the various houses are for a standard sash held in place by buttons or hinged in such a way that the entire window opening may be utilized in periods of warm weather and sunshine. The openings for the windows depend upon size of the sash or panel, whether or not the stud is used as the casing.

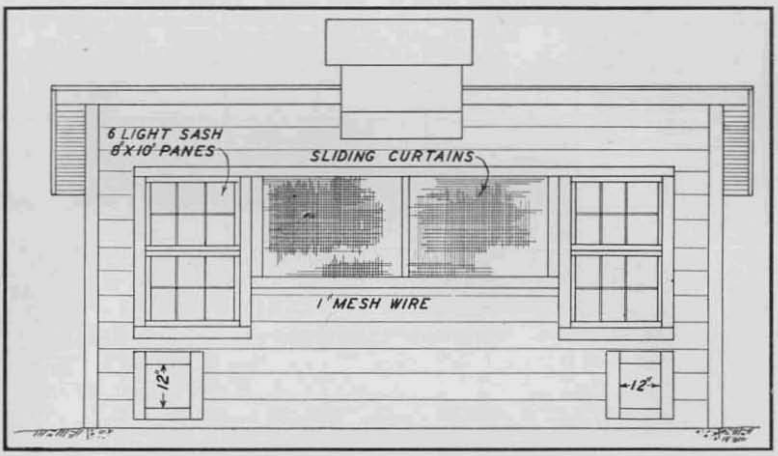

Fig. 11. Front elevation of the shed roof laying house.

Note that two different plans of window arrangement are illustrated for the Gable Ceiling Insulated House (*See Fig.* 8). In the modified straw loft Half-Monitor House, the upper windows are hinged alternately—two at the top of the sash and one at the bottom (*See Fig.* 4). Where windows are installed in such a way that they can be completely removed, it is a good practice to arrange for their convenient and safe storage by providing brackets or racks in which they can be placed along the walls or ceiling.

Insulation—The value of insulation in connection with poultry house construction has been discussed under ventilation. In general, however, there are three types of commercial insulation consisting

of the rigid board, the blanket roll, and the loose granular or wool type of material. The insulating value of all porous materials decreases rapidly with increased moisture content. For this reason waterproof building paper should be used between the studding and siding to prevent moisture from entering the wall section whenever such materials as planer shavings or cut straw are used for insulation. It has been found that dry planer shavings are very satisfactory insulating material provided they are dry and well packed in the walls to prevent settling and the consequent development of uninsulated areas.

Painting—All exterior wood construction should be given at least two coats of a good grade of outside paint and the interior should be given at least one priming coat of linseed oil or whitewash. The surface to which paint is applied should be clean and dry. Most paint failures are the result of moisture either coming through the

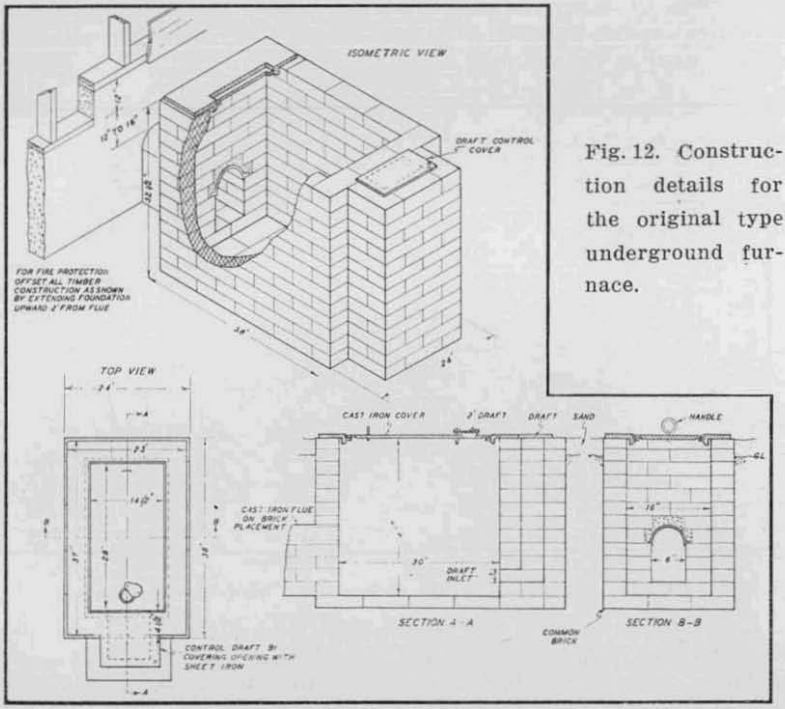

Fig. 12. Construction details for the original type underground furnace.

lumber after the paint has been applied, or resulting from a damp condition at the time of application. By using a good grade of paint full benefit from the labor required for its application may be obtained.

Furnace construction—The details of construction for the regular type furnace is illustrated in Figure 12. It will be observed that the

furnace is 16 inches wide, 30 inches long, and 30 inches deep (inside measurements). In terms of brick it is 4½ bricks long, 3 bricks wide, and 13 bricks high. Common bricks are used laid up in mortar. The floor level of the house is the basis of figuring the depth of the furnace and the depth and slope of the flue under the floor. The top or cover of the furnace needs to be of such a material that it will not warp; malleable cast iron appears to give the best service.*

A modification in the construction and operation of the furnace is illustrated in Figure 13. This type allows the furnace to be fired through the door in the front end. A pit in front must necessarily be provided for this purpose. The chief advantage of this type is that there is less hazard from smoke and sparks as compared with the type that opens at the top.

Flue—The top of the flue should be at least 12 inches below the floor level at the furnace and 4 inches below the floor level at the chimney. From this description it will be noted that the flue is built on a slant for the purpose of developing proper draft and securing a uniform heat throughout the length of the flue. A flue that is laid beneath a concrete floor should be of a type of material that

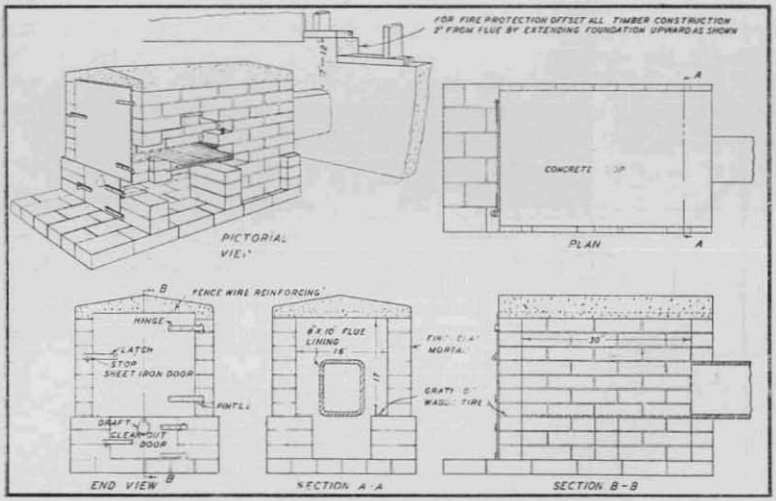

Fig. 13. Construction details for the type of underground furnace to be fired from the end.

will insure permanency. Ordinary clay sewer or drain tile cannot be regarded as such. If tiling is used it should be of fire clay. Whatever the type of flue, it should have a capacity equivalent to 8 inches in diameter. Figure 12 illustrates a flue with brick side walls (3 bricks high) and a malleable cast-iron top. To avoid the possibility of the flue being filled with rodents a solid bottom (preferably of concrete) is necessary. The clean-out hole in the chimney should

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

be provided as indicated in Figure 5. Should the flue fill with soot it may be cleaned by running a wire, to which is attached a burlap mop, through the flue. The chimney at the end of the building should be of brick laid up with mortar.

Equipment

All interior equipment should be elevated above the floor and should be removable.

Roosting quarters—Roosts are usually made out of 2x2 material with the top corners beveled; as a general rule 6 to 8 inches per bird is the recommendation. Wire netting of 1½- to 2-inch mesh should be attached under the roosts and extended down to the droppings boards in front to reduce the contact of birds with droppings and as an additional measure for obtaining clean eggs.

Under average conditions, the roosting area is the hottest place in the house at roosting time during midsummer. This is especially true when droppings boards are built tight against the rear walls and there is no means of introducing fresh air over the roosting area. As a suggestion to improve this condition, the droppings boards are shown constructed as a flat top resting on cleats so that it can be pulled away from the rear wall to the extent desired. There should be at least one inch of space in the winter and from 2 to 4 inches in the summer.

Nests—Two types of nests are illustrated—the regular open nests arranged in tiers along the side wall or partition, and a new type of sanitary nest arranged in batteries or in sections that is

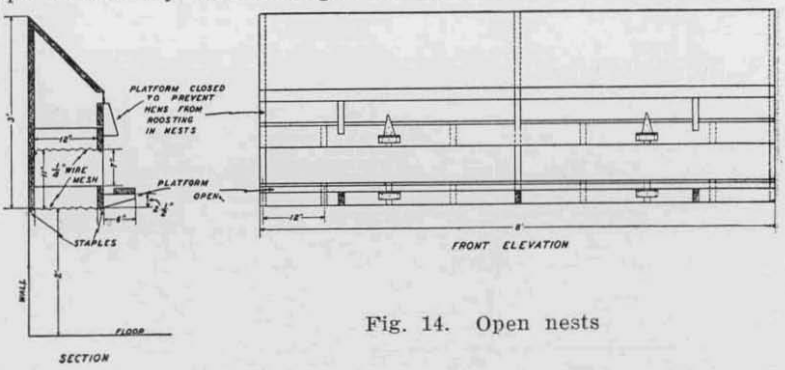

Fig. 14. Open nests

patterned after a type developed on a farm in northern Idaho. In this latter type (*Fig.* 15) the entrance for the hen is from the back and the wire bottom is sloped so that the egg rolls out from the nest proper into a separate space in front. This provision is a great aid in producing clean eggs; it also prevents other hens from nesting on previously laid eggs. The platform in front of the open nests is sometimes left off except for the top tier; this prevents hens from walking along the nest and picking those laying. Another means of preventing picking is to move the nests out about a foot from the wall, thus providing an entrance from the rear. A door is hinged in front to facilitate gathering eggs. The usual practice is to provide

one nest for 6 or 7 hens. Half-inch mesh wire is suggested for the bottom; however, straw should be used in the nest for breaking the pullets to the nest in the fall. In solid bottom nests, shavings make the best litter.

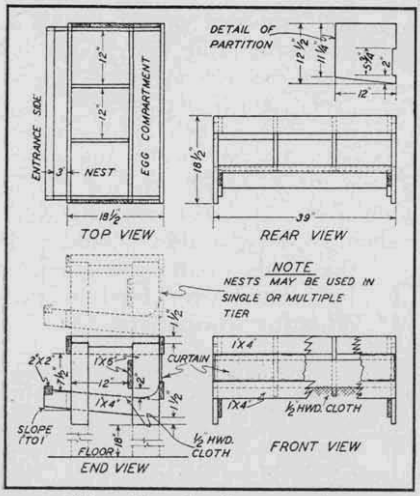

Fig. 15. Sanitary nests.

Mash hoppers—Two styles of mash hoppers are illustrated—the open top floor type equipped with a reel (*Fig.* 16) and the wall type with storage capacity. The plans illustrated are designed to keep the birds out of the feed and to prevent waste. Approximately one foot of feeding space for every five hens is required.

Watering devices—Water and milk containers should be of a type that is easily cleaned, elevated on platforms, and so fastened as to prevent spilling. Where running water is available, a trough provided with an overflow and drain is a worthwhile labor-saving device. (*See Fig.* 18).

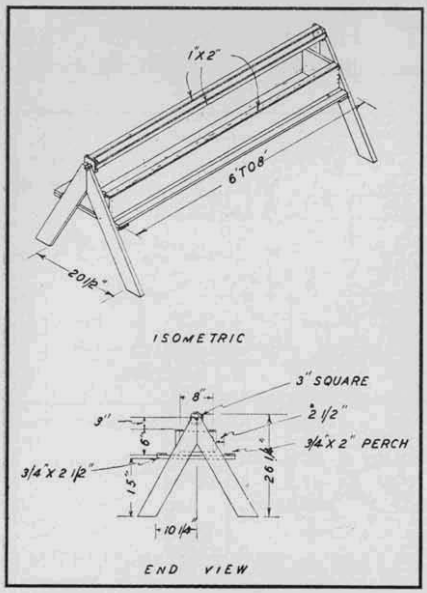

Fig. 16. Open mash hopper.

Lighting

The use of artificial lights for the purpose of lengthening the day and increasing the feed consumption during the winter months has become a standard practice. Electric lights should be a part of the regular housing equipment whenever electricity is available. On a rural line service one 60- to 100-watt lamp equipped with reflector will be satisfactory for each 200 square feet of floor area; on the farm plant installation, a 40- to 50-watt lamp should be the minimum.

The type of wiring required for a poultry lighting installation

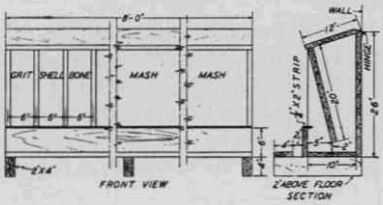

Fig. 17. Wall type mash hopper.

depends upon the value and permanence of the building and personal preference. The knob and tube system usually costs less for materials. However, the non-metallic armored cable or metallic armored cable are well adapted to poultry house wiring. The lamp and reflector units may be hung about 5½ feet from the floor so that the workmen can easily see them; otherwise they should clear the heads of the workmen, or be located over feed hoppers or water containers.

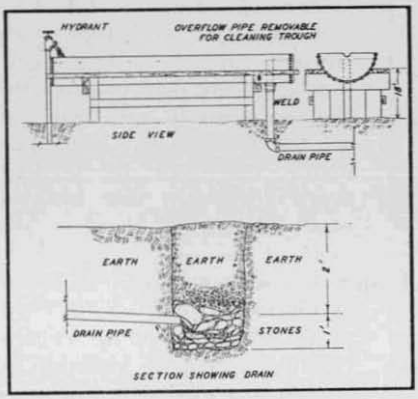

Fig. 18. Sanitary drinking trough.

In any system of evening lighting, it is necessary to dim the lights for about 15 minutes to encourage the birds to go to the perches. There are three general methods of producing dim lights. First, the parallel series circuit wherein the same lights are used for bright and dim, obtaining the reduction in light intensity by changing the circuit from a parallel for bright lights to a

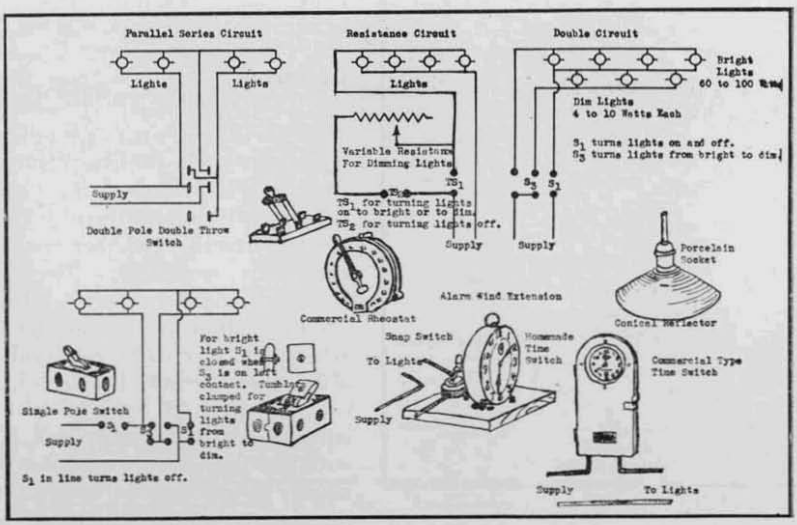

Fig. 19. Detail of lighting, showing three circuits for dimming the lights in the laying house.

series circuit for dim lights. With the development of the more efficient lamps, this circuit is not as popular as formerly, due to the fact that the lamps remain too bright on the series circuit. The second method of dimming lights is to use a rheostat, usually in the form of a variable resistance that lowers the voltage in the main circuit to a point where the lights operate at a fraction of their usual lighting intensity. The third method is to use a double circuit, employing full voltage at all times and using lamps of varying intensity. The dim circuit usually consists of fewer lamps of much less wattage; for instance, a 10-watt lamp or a Neon-glow lamp has been found satisfactory for the dim circuit of this type of installation.

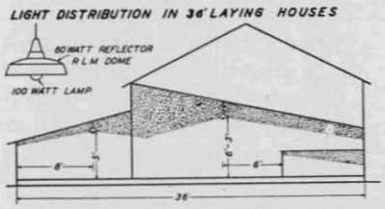

Fig. 20. Light distribution of the 36-ft. laying house.

The bright lights should be fitted with waterproof sockets and equipped with reflectors to concentrate the light on the floor and feeders. The size of the reflector will depend upon the wattage of the lamp and the floor area to be lighted. Although the steel enamel reflector is more efficient, the painted metal type is quite satisfactory and much cheaper (*See Fig.* 20 for light distribution in the 36-foot laying house).

MANAGEMENT AND OPERATION

Many detailed operations are involved in any phase of poultry raising—the matter of housing is no exception. Convenience and cleanliness always offer an inducement for greater regularity in the detail chores. Greater routine is required in the fall after the pullets are moved in and during winter to keep the house dry and properly ventilated. The changeable weather associated with different wind velocity and periods of high humidity necessitates frequent attention to the regulation of window and flue openings.

The actual manipulation of the openings, whether they be windows or flues, and other details of management of the laying house must vary with the conditions prevailing in various localities. There is no set rule and no fool-proof system. The same type will need to be operated differently in different locations. Every house in its particular location constitutes a specific problem in ventilation.

The average person closes the outlets too much with the first cold weather. This is a mistake because in so doing he creates a natural trap for the warm moist air in the upper part of the house. The moisture condenses, which causes the walls and litter to become damp. In severe weather the intakes should be closed to a greater

extent than the outlet. Such a procedure automatically reduces the amount of air which passes through the building without definitely interfering with the natural flow of air. As a general rule, then, a positive circulation of air must be provided by outlets near the higher portion of the house and the flue system of ventilation must be provided with outlets that establish a definite "pull" in order to be efficient.

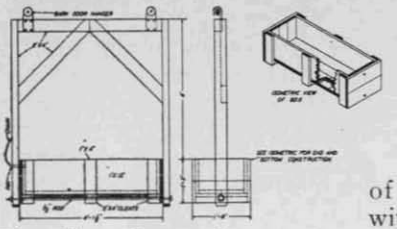

Fig. 21. Homemade litter carrier.

Field observations and experiences with the modified straw loft half-monitor house furnish a basis for the suggestions which follow: The straw chutes and cupolas function as outlets in the ventilation in this type of house, and for this reason should remain open at all times. End doors in the loft should be kept closed except during hot weather. If allowed to remain open in cold weather, a down draft is experienced.

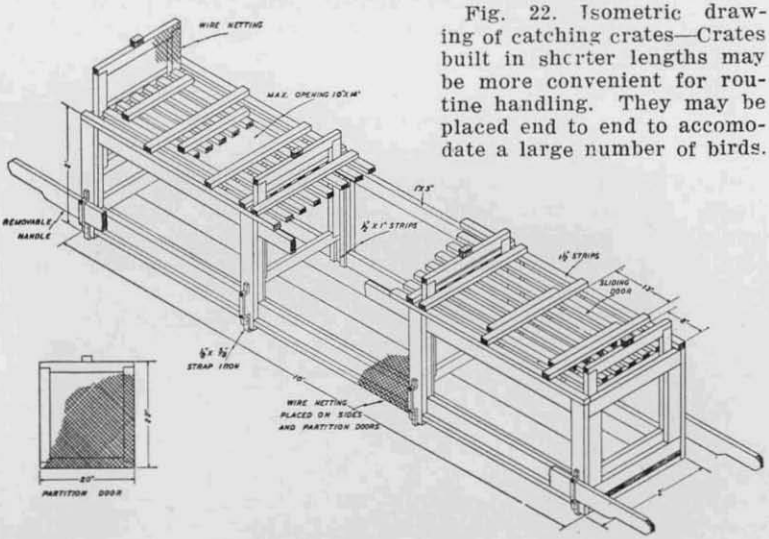

Fig. 22. Isometric drawing of catching crates—Crates built in shorter lengths may be more convenient for routine handling. They may be placed end to end to accomodate a large number of birds.

Should weather conditions, either wind, cold, or storm, require curtailment of air movement through the house, this can best be accomplished by closing the windows and curtains. They may be entirely closed in the modified half-monitor straw loft house throughout the period of a storm or cold weather with assurance of thorough ventilation and a dry house, provided that straw chutes and cupolas

are built according to specifications with respect to the number specified and left open.

The straw loft in this type of house will hold the straw necessary for a year's litter supply, which, if put in while dry, solves the problem of ample and dry litter. As the straw is removed a layer of several inches should be left over the area of the ceiling until the final fall cleaning. At this time all the straw should be removed in order that a thorough job of cleaning can be done.

During the summer the layer of straw above the roosts should be reduced to the extent of allowing a ready circulation of air up into the loft. All windows and curtains should be opened to establish cross circulation of air as an aid in keeping the house cool.

BILL OF MATERIALS

Modified Half-Monitor Straw Loft Laying House

Framing

Dimensions No. Pcs.	Size in Inches	Length	Use	Grade	Material	No. of Board Feet
42	2x6	16′	rafters	No. 1	common fir	672
8	2x4	12′	rafters	No. 1	common fir	64
32	2x4	10′	rafters	No. 1	common fir	213
21	2x4	10′	rafters, straw loft	No. 1	common fir	140
21	2x4	16′	rafters, straw loft	No. 1	common fir	224
9	2x4	12′	collar beams	No. 1	common fir	72
4	2x6	20′	plates	No. 1	common fir	80
4	2x4	20′	plates	No. 1	common fir	53
4	2x4	18′	sills	No. 1	common fir	48
4	2x4	20′	sills	No. 1	common fir	53
8	2x4	16′	studs	No. 1	common fir	84
8	2x4	14′	studs	No. 1	common fir	75
8	2x4	12′	studs	No. 1	common fir	64
19	2x4	10′	studs	No. 1	common fir	127
6	2x4	8′	studs	No. 1	common fir	32
2	2x4	20′	purlin plates	No. 1	common fir	27
2	2x8	20′	purlin plates	No. 1	common fir	53
3	4x4	14′	posts	No. 1	common fir	64
11	4x4	10′	posts	No. 1	common fir	147
1	4x4	20′	posts	No. 1	common fir	27
4	4x4	20′	beams	No. 1	common fir	106
5	2x4	10′	droppings board supports	No. 1	common fir	33
4	2x4	16′	perch supports	No. 1	common fir	43
14	2x2	18′	perches	No. 1	common fir	84
4	2x4	12′	window frames	No. 1	common fir	32
2	2x2	12′	ventilator frames	No. 1	common fir	8
3	2x6	16′	window sills	No. 1	common fir	48
4	2x6	10′	window sills	No. 1	common fir	40
1	2x6	14′	window sills	No. 1	common fir	14
1	2x4	12′	door frames	No. 1	common fir	8
2	2x4	12′	straw chute frame	No. 1	common fir	16
2	2x4	10′	straw chute frame	No. 1	common fir	14
2	1x6	10′	straw chute frame	No. 1	common fir	20
8	2x4	12′	rafters, furnace room	No. 1	common fir	64
5	2x4	14′	studding, furnace room	No. 1	common fir	47
1	2x4	18′	sill, furnace room	No. 1	common fir	12
2	2x4	16′	collar beam, furnace room.	No. 1	common fir	21
1	2x4	12′	plates, furnace room	No. 1	common fir	8
1	4x4	8′	posts, furnace room	No. 1	common fir	11
			Total board feet			2948
	1x4		flooring	No. 1	common	580
	1x8		shiplap	No. 1	common	2240
	1x6		rustic V. siding	No. 1	fir, red cedar	2000
	1x4		trim	No. 1	common pine	250
	1x6		straw loft floor	No. 1	common pine	740
						5810
			Total of lumber			8758

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
14 12′x14″ 4-light barn sash
4 10″x12″ 3-light barn sash
1 8″x10″ 4-light barn sash
1 rim lock door set
20 ¾″x10″ drift pins
10 ¾″x10″ bolts with nuts and washers
10 yards of ¼″ hardware cloth, 2 feet wide
10 yards of muslin, 2 feet wide
30 pounds 16d nails
100 pounds 8d nails
6 pair 10″ extra heavy T hinges
2 door pulls
2 thumb latches with padlock attachments
2 foot bolts
2 chain bolts
2 padlocks

BILL OF MATERIALS

Gable Ceiling Insulated Laying House

Framing

Dimensions No. Pcs.	Size in Inches	Length	Use	Grade	Material	No. of Board Feet
20	2x2	12′	roosts	No. 1	common fir	67
73	2x4	16′	joists, rafters	No. 1	common fir	779
60	2x4	12′	headers & cupola framing	No. 1	common fir	480
14	2x4	14′	studs	No. 1	common fir	130
19	2x4	10′	studs, droppings boards	No. 1	common fir	126
16	2x4	12′	studs, droppings boards	No. 1	common fir	128
6	2x6	16′	girder	No. 1	common fir	96
2	2x6	16′	barge boards	No. 1	common fir	32
2	2x6	12′	barge boards	No. 1	common fir	24
3	2x8	14′	window sills	No. 1	common fir	56
3	4x4	8′	posts	No. 1	common fir	32
						1951

Siding, Sheeting, and Trim

2	1x4	16′	door trim	Clear	white pine	11
2	1x4	14′	cupola trim	Clear	white pine	10
8	1x4	12′	louvers and trim	Clear	white pine	32
6	1x4	10′	window trim	Clear	white pine	20
8	1x6	12′	ridge boards	Clear	white pine	48
2	1x6	14′	door trim	Clear	white pine	14
2	1x6	12′	door trim	Clear	white pine	12
2	1x6	10′	door trim	Clear	white pine	10
						161
29	1x6	14′	roof truss	No. 3	Larch or red cedar	196
2	1x6	12′	braces			12
						208
	1x6		rustic V. siding	No. 1	Fir or	1190
	1x8		shiplap	No. 1	red cedar	2310
			shiplap roof boards	No. 3		1310
						4810

Total board feet 7130

2 rolls, large building paper ..... 1000 sq. ft.

Roofing and Hardware

Shingles, 48 bundles, 4½″ to weather
35 pounds 20d nails
110 pounds 8d box nails
5 pounds 8d finish nails
56 pounds 4d shingle nails
16 ½″x12″ anchor bolts, washers and nuts
8′ light chain
3′ 1″-mesh hardware cloth, 36″ wide
80′ 1½″-mesh chicken wire, 36″ wide
22 2″ butt hinges
2 door latches
4 T door hinges

Foundation and Floors

115 sacks Portland cement	
10 cubic yards sand.	1:2:3 mix—floor
17 cubic yards gravel.	1:2½:5 mix—foundation

Windows

4 3-light cellar sash	10″x12″ panes
16 6-light plain sash	8″x10″ panes

For Curtain Panels

ADD	SUBTRACT
1 1″x4″x16′	2 1″x6″x10′
5 1″x4″x12′	2 1″x4″x12′
2 2″x8″x16′	4 1″x4″x10′
4 1″x3″x16′	2 2″x8″x14′
4 1″x3″x12′	8 8″x10″ pane 6-light plain sash
16′ muslin 36″ wide or glass substitute	

BILL OF MATERIALS

Shed Roof House

Framing

No. Pcs.	Dimensions Size in Inches	Length	Use	Grade	Material	No. of Board Feet
4	2x2	16′	rocsts	No. 1	common fir	21
8	2x4	10′	studding, window framing	No. 1	common fir	53
4	2x4	12′	studding	No. 1	common fir	32
3	2x4	14′	studding	No. 1	common fir	28
26	2x4	16′	sills, plates, studs, framing	No. 1	common fir	277
2	2x4	18′	studding	No. 1	common fir	24
2	2x4	20′	sills	No. 1	common fir	27
9	2x4	22′	rafters	No. 1	common fir	132
	Total board feet					594

Siding, Sheeting, and Trim

5	1x4	12′	corner boards trim	Clear white pine		20
2	1x4	14′	trim	Clear white pine		9
1	1x4	16′	trim	Clear white pine		5
4	1x4	18′	corner boards	Clear white pine		24
2	1x4	22′	side roof trim	Clear white pine		15
1	1x8	8′	trap door	Clear white pine		5
1	1x12	8′	ventilator	Clear white pine		8
1	1x12	10′	ventilator	Clear white pine		10
	Total board feet					96
	1x6		rustic V. siding	No. 1 Fir or Red Cedar		570
	1x8		shiplap	No. 1 Fir or Red Cedar		1200
	Grand Total Board Feet					2460

Roofing and Hardware

4 rolls of asphalt roofing
1 roll of rosin paper
2 gallons of paint
½ gallon trim
3 pairs of 6" strap hinges
2 thumb latches
4 casement fasteners
6 pairs of 3" butt hinges
10 pounds of 16d nails
50 pounds of 8d nails
10 pounds of 10d nails
8′ of 36" hardware cloth, 1"-mesh
8′ of muslin, 36" wide
4 6-light, 8"x10" sash
2 3-light, 10"x12" sash
18 ¾"x10" drift pins

Foundation and Floor

25 sacks of cement
3 cubic yards of gravel
2 cubic yards of sand

1:2:3 mix—floor