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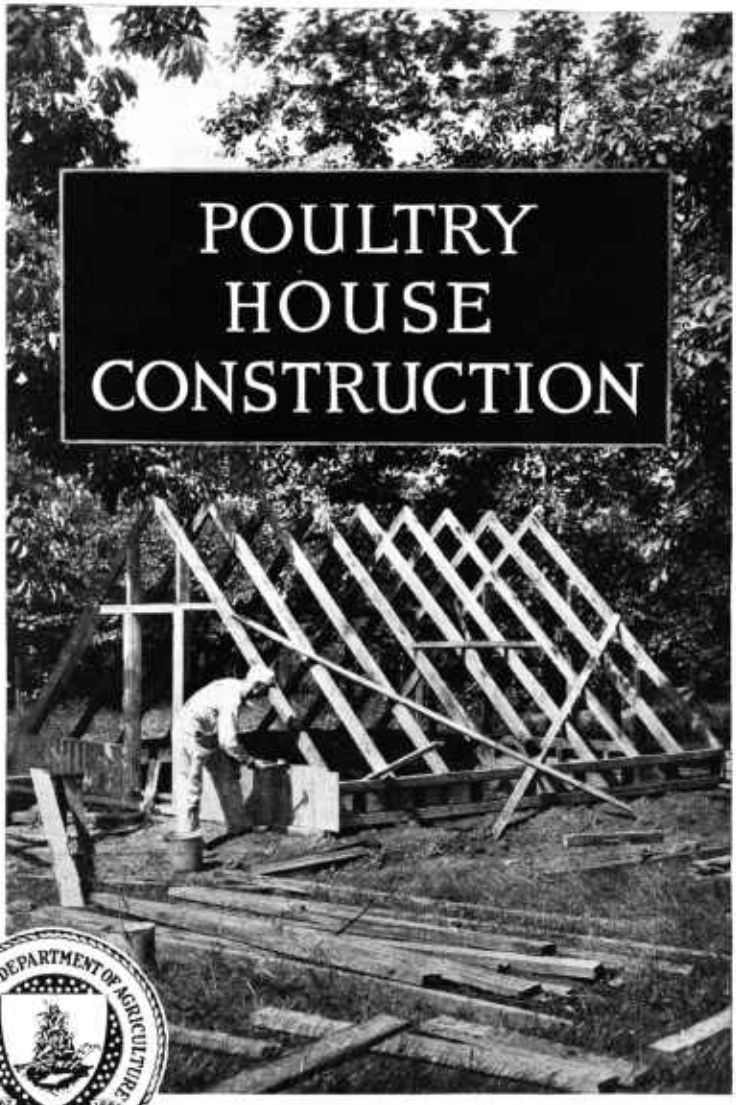
POULTRY HOUSE CONSTRUCTION



HENS need a comfortable house, one that is dry and roomy, with plenty of fresh air and sunlight. It never pays to overcrowd them.

A plain shed-roof house is most economical, and most satisfactory. It should be so arranged that it will be easy to clean and for general convenience.

It is easier to keep the birds healthy, and to reproduce the stock under the colony system, if the birds are allowed free range. Breeding stock, and especially growing chickens, should have plenty of range. Hens used solely for the production of market eggs may be kept on a very small area.

Detailed information on how to build, and working plans of various types of poultry houses, are given in the following pages. With these anyone handy with tools can build similar poultry houses.

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POULTRY HOUSE CONSTRUCTION

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ESSENTIALS IN POULTRY HOUSES

THE IMPORTANT CONSIDERATIONS in building poultry houses are fresh air, dryness, sunlight, economy of labor, and space enough to keep the birds comfortable.

Fresh air is essential. Hens will do well in a cold house, provided the house is well ventilated. Dryness is necessary. Not only should the building be tight to keep out the rain, but the moisture from the chickens within the house must be carried off by ventilation. The more sunlight in the house the better, as this helps to dry out the moisture and also makes the building more sanitary. As labor is a big item, arrangement of the house for convenience in labor adds greatly to the chances of success. Hens to do well need sufficient roosting and floor space, so they will be comfortable at night and will exercise freely during the day.

Different styles of houses are used successfully in all sections of the United States. A plain shed-roof house with openings in front and rear, according to climatic conditions, is well adapted for any section of the country. In the South the houses may be less tight and the front should be much more open than in the North. Many of the State agricultural colleges have plans for poultry houses which are especially recommended for their respective States.

LOCATION AND SITE

The location should have good drainage of water and air, so that the floor and yards will be dry. The house should not be in a low pocket or hollow in which cold air settles. Wherever possible a southern or southeastern exposure should be selected, although this is not so vital if there is any good reason for facing the house in

some other direction. The common practice in most sections of California is to face houses east on account of winds and storms.

Poultry can be raised successfully on any well-drained soil. A light loam which will grow good grass is well adapted for this purpose, while a very light sandy soil through which water leaches freely is best adapted for intensive poultry keeping. Most of the green feed for fowls kept on such a soil will have to be purchased. A heavy clay or adobe soil is not well adapted to poultry raising, as such land does not drain readily, which makes it much more difficult to keep the stock healthy.

TYPES OF BUILDINGS

There are two general types or arrangements of poultry houses—long, stationary houses, holding from 500 to 1,500 hens, and small, movable houses (colony houses), which are scattered over a wider area. Many poultry farms use both types, the long house for the laying flock and the smaller colony houses for the breeding stock.

The long, stationary house, or the intensive system, saves steps, but it is easier to keep the birds healthy and to reproduce the stock under the colony system, where the hens are allowed free range. Breeding stock, and especially growing chickens, should have abundance of range, while hens used solely for the production of market eggs may be kept on a very small area with good results.

The colony-house system necessitates placing the houses, each holding about 100 birds (including hens and growing chickens), from 150 to 200 feet apart, so that the stock will not kill the grass. The colony system is practicable only on cheap land, or where it can be combined with stock raising, using the pasture both for poultry and for livestock. Fences can be placed around each colony house to keep the livestock away from the poultry feed and water.

One of the most common arrangements for a long house for laying hens is to have large yards on both sides, making each yard 150 feet deep and the length of the house. Smaller houses can be used to advantage in combination with this for the breeding stock, giving them either free range or more yard space. The long houses are also used by many persons for breeding stock, but the birds do not usually make such good breeders as those kept in colony houses with more yard space.

YARDS AND FENCES

Fences dividing the land into yards increase the cost of equipment, labor, and maintenance. Fences should be few. Land can be cultivated and kept sweet more easily if not fenced, and the value of fresh, sweet land for poultry can hardly be overestimated. A good grass sward can be maintained on fertile soil by allowing from 220 to 260 square feet of land per bird (200 to 167 birds to the acre). More space per bird is necessary on poor or light land. A much larger number of fowls is usually kept to the acre on sandy soil, where double yards are used and the land is frequently cultivated. Under this system as many as 1,000 laying hens are sometimes kept on 1 acre, for egg production only, when the stock is not used for breeding and no chicks are raised.

The general-purpose and meat breeds in small yards require fences from 5 to 6 feet high, while a fence 6 to 7 feet high is necessary for Leghorns. To keep Leghorns in, it may help to slant the upper 2 feet of the fence in at an angle of about 30°. A strand or two of barbed wire strung on top of the woven wire is good. It is sometimes necessary to clip the flight feathers of one wing of those birds which persist in getting out. A board or wooden strip along the top of the fence is not advisable, as hens will often fly over such a fence.

Posts may be set or driven. They should be from 8 to 10 feet apart for common hexagonal poultry netting, or 16 to 20 feet for woven wire. Woven-wire fencing makes a better-looking fence, and will last much longer than the common poultry netting. Corner posts should be about 8 inches in diameter, set 4 feet in the ground. Line posts may be 4 or 5 inches in diameter, set 3 feet in the ground.



FIG. 1.—Colony house used at the U. S. Experiment Farm, Beltsville, Md. This house is built on runners so that it can be easily moved. (See figs. 2, 3, and 4.)

Light posts, driven down, are all right for temporary fences. Treating the ends that will be below ground with creosote or other preservative will make the posts last longer. Brace the corner posts, or set them in concrete, or do both.

SIZE AND CAPACITY OF HOUSES

A house so built that the attendant can stand up and work conveniently will have enough cubic air space, if from 3 to 5 square feet of floor space per fowl is allowed. Provide fresh air by ventilation; large cubic space in a house is not a substitute for ventilation. The extent of floor space necessary depends on the system, size of pens, weather conditions, and size of the birds. More birds can be

kept on a small floor area under the colony system than under the intensive system, where the climate is mild and the hens have free range most of the year. Three square feet of floor space per bird should be allowed with good-sized flocks of Leghorns and 4 square feet with general-purpose breeds, increasing this to 3½ square feet for Leghorns and 4½ square feet for general-purpose breeds when flocks are small. Three square feet is enough for Leghorns and 3½ square feet for the general-purpose breeds when kept in colony houses with free range in a mild climate.

Colony houses accommodating from 30 to 50 hens or nearly grown chickens are about as large as can be moved easily, but larger numbers may be kept in one flock in a long house. Flocks of from 100 to 500 are well adapted to average conditions for the production of market eggs. Large flocks require less labor, fewer fences, and a lower house cost than small flocks, but there is a greater risk of disease, and the individual hen receives less attention.

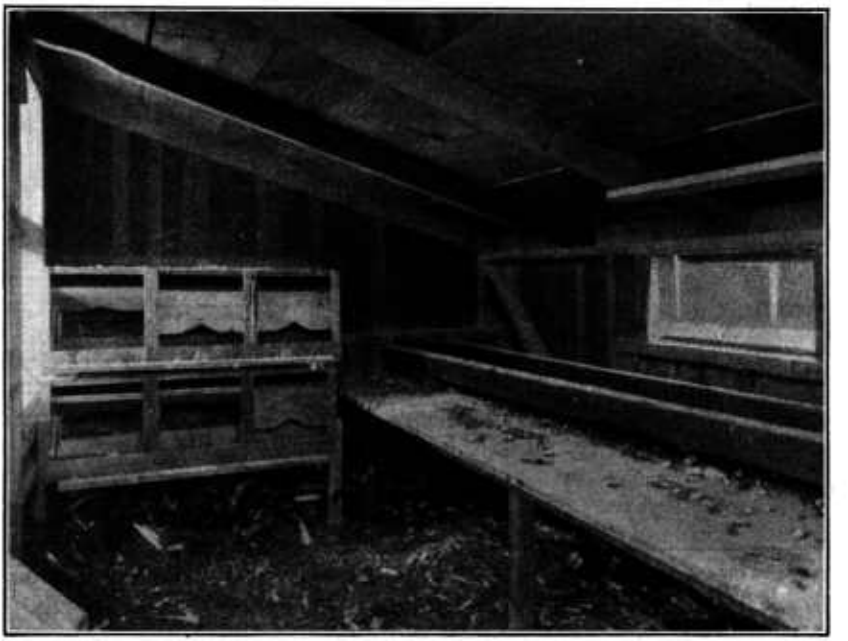


FIG. 2.—Interior of colony house used at U. S. Experiment Farm, Beltsville, Md.

Figure 1 shows a colony house which is 10 feet long and 7 feet deep. This house is used extensively on the United States Experiment Farm, Beltsville, Md. The capacity of this house is 25 hens, where used either on free range or with good-sized yards. The house is built on runners, so it can be moved to fresh soil every year or two. Interior view, detailed plans, and bill of material of this house are shown in Figures 2, 3, and 4.

COST OF BUILDING

On a basis of 4 square feet per hen, substantial poultry houses can be built for from $2 to $2.90 per head, including labor. The cost

of material per head varied in 1923 from $1.25 to $1.75. When the labor is hired it costs at least two-thirds as much as the material, and in some cases equals the cost of the material. Bills of materials are given with the different plans of houses in this bulletin.

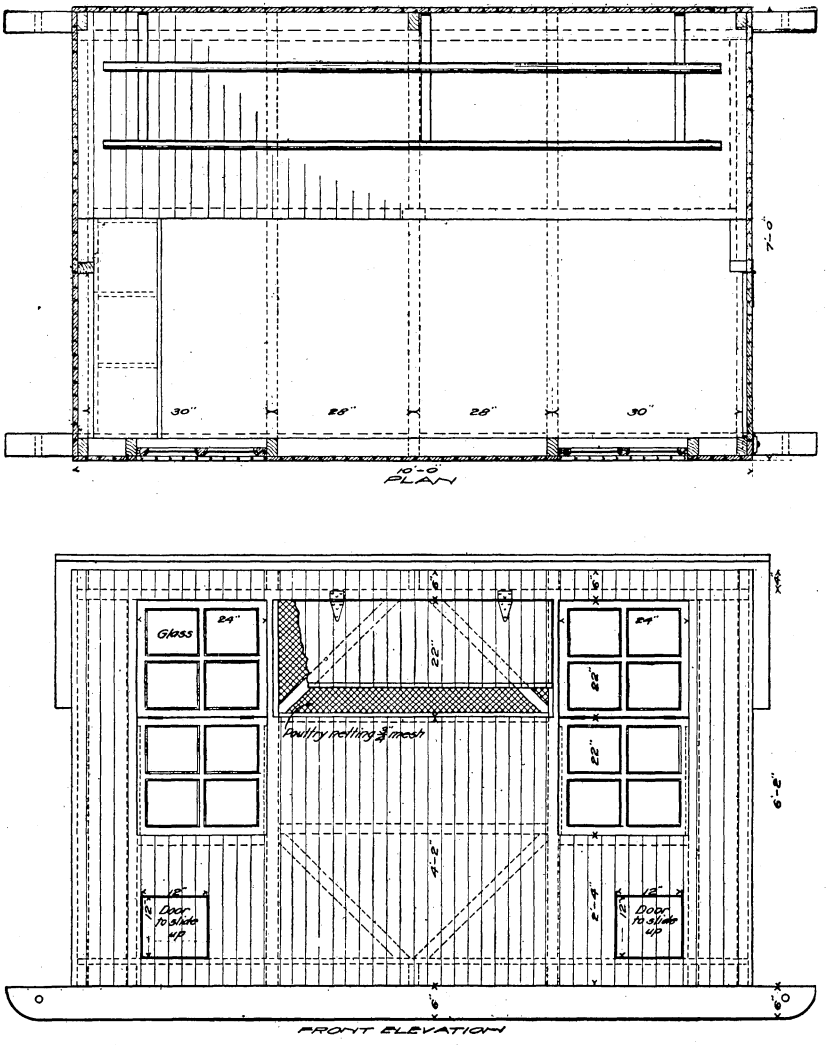
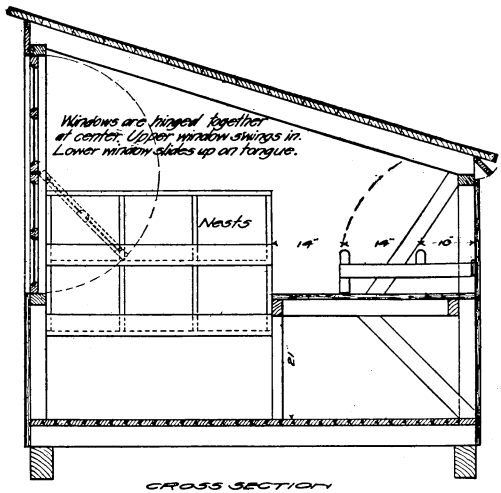


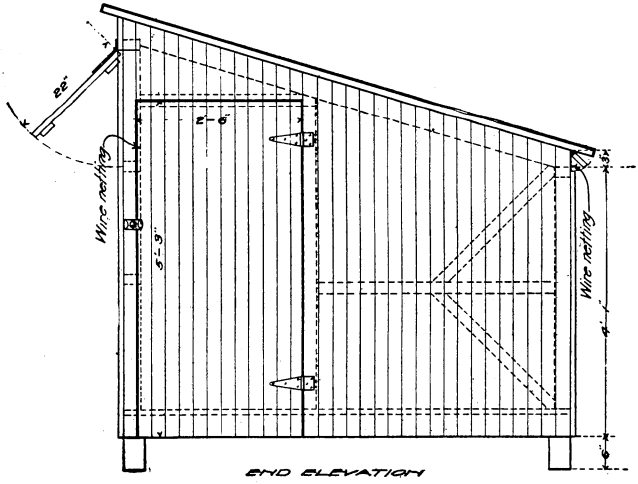
FIG. 3.—Floor plan and front elevation of colony house used at the U. S. Experiment Farm, Beltsville, Md. Capacity, 25 hens. (See figs. 1, 2, and 4.)

DETAILS OF POULTRY-HOUSE DESIGN

ROOF

The roof should be water-tight. Shingle roofs should have a one-third pitch. Composition or metal roofs may have a less pitch or be





BILL OF MATERIAL FOR COLONY HOUSE

USE	SIZE	No OF PIECES	LENGTH FEET	BOARD MEASURE
Sills (runners)	4x6"	2	12'	48'
Joists	2x4"	3	14'	28'
Studs & braces	2x3"	13	12'	78'
Rafters	2x4"	9	16'	32'
			Total	186'
7/8" Matched flooring (floor & sides)				340'
7/8 Sheathing, surfaced one side.				100'
Roofing paper, 1 roll.				
Windows, Hardware etc.				

FIG. 4.—Cross section and end elevation of colony house used at U. S. Experiment Farm, Beltsville, Md. Capacity, 25 hens.

almost flat. However, the greater the slope the longer the life of the roof. Different types of roofs are illustrated in Figure 5.

The shed or single slope roof is practical for houses up to 20 feet in width if a girder and posts support it. A girder is needed only in shed-roof houses wider than 14 feet. Twenty feet is as wide as is ordinarily advisable for a house for laying hens, unless there is an aisle. The shed-roof type is practical and easy to build. It allows a high front to the house, and prepared roofing will last longer on a north slope than on a south one.

The combination or two-pitch roof of uneven length, and the semi-monitor roof (fig. 5) are adapted for buildings from 16 to 24 feet wide, while either of these styles, or the monitor and the gable roofs may be used for wider buildings. The combination roof on a house more than 16 feet wide gives good head room at a moderate cost, reduces the amount of surplus air space, and makes a good-looking building. The shed-roof type is cheaper but not so good looking.

The semimonitor and monitor types are best for wide houses which have a central alley, and are commonly used for large brooder houses. The semimonitor house usually faces south. The monitor type of roof is frequently used on buildings facing east and west.

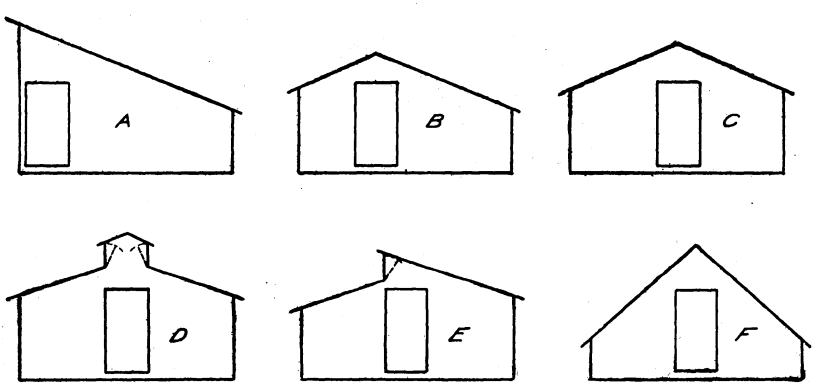


FIG. 5.—Types of roofs for poultry houses. *A*, shed; *B*, combination; *C*, gable; *D*, monitor; *E*, semimonitor; *F*, A-shaped

The gable roof is used extensively for two-story buildings, for brooder houses, and for incubator cellars. This style of roof is usually ceiled at or slightly above the eaves, or the gable may be filled with straw or some kind of absorbent material, which tends to keep such houses dry and warm. If straw is used, there should be an opening in each gable to allow air circulation.

The A-shaped roof is used for growing coops and colony houses. With a wall 18 inches high it provides a large amount of floor space with a minimum of lumber, but increases the roof surface, which is the most expensive part of the house.

FRONT AND REAR

A house with the entire front open is commonly used in the South. One in which from one-fourth to one-third of the front is curtains

and windows is used in the northern part of the United States. Curtains and windows make up from one-third to one-half of the front of the house in the sections between these two extremes. The openings in the front are covered by glass and muslin curtains, so that the amount of open space can be varied according to the season and weather conditions. Glass is most essential in the North, and some glass in the front is desirable in all but open-front houses.

Wooden shutters or wind bafflers are sometimes used in the front of the poultry house, providing an opening through which the air can always circulate without allowing rain to beat into the house. The main objection to these shutters is that they shut out sunlight.

Windows in the rear of the poultry house, between the floor and the dropping boards (as shown in figs. 14 and 16), are desirable in wide houses. They let more light in on the floor, and help to keep the litter better distributed, as hens always scratch the litter away from the light.

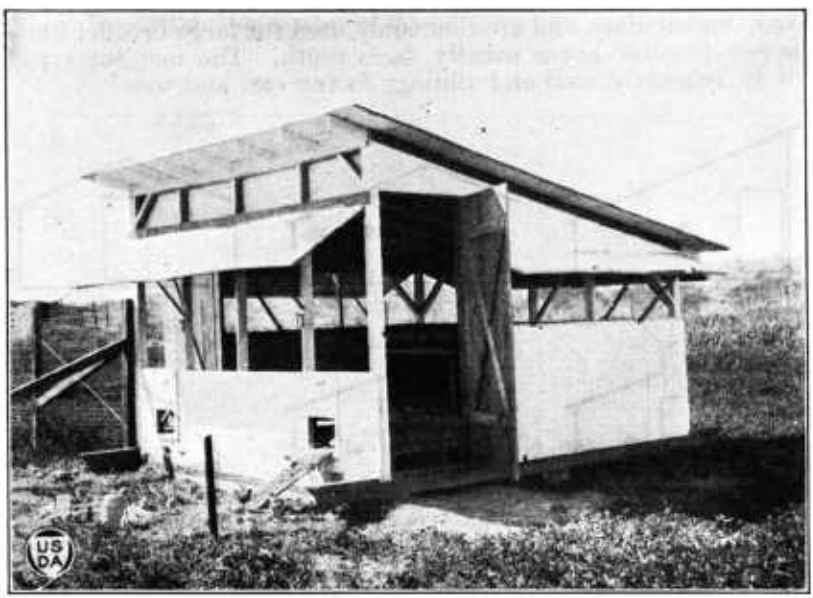


FIG. 6.—Shed-roof house used on the U. S. Experiment Station, Glendale, Ariz. This house is especially adapted for extreme southern conditions. It is 12 by 12 feet and will accommodate about 40 hens

A weather shield, 2½ to 3 feet wide, extending downward like an awning at an angle of 45 degrees from the top of the front, prevents rain from beating into the house. Such shields are particularly good where prevailing rains come from the south.

In order to give extra ventilation in hot weather, in the latitude of Washington, D. C., and all places south of that, there should be an adjustable ventilator opening in the rear side of the house. This opening is usually made the entire length of the house, between the plate and the eaves. It must be made so that it can be closed tightly in cold weather. Such an opening is shown in Figures 4 and 13.

A type of house, with openings on all four sides, for use in the extreme South, is shown in Figure 6. This is a colony house, built on runners so it can be moved, and has a wooden floor. The openings have shutters which provide shade and also keep rain from beating in. Protection from the sun is as essential in the extreme South as protection from rain. The front shutter covers only part of the front openings, but is large enough to keep out the rain.

A large amount of glass in the front of the house makes the house warm during the day and cold at night, as glass radiates heat very rapidly. Unbleached muslin, or a light weight of duck cloth, is used for curtains in the fronts of poultry houses. This cloth should be thin enough to allow a slow circulation of air without a draft, but the object is defeated by using too heavy a grade of duck or by oiling or painting the cloth.

The front of the house should be high enough so that the windows or openings will allow the sun to shine well back into the house during the winter. The depth which the sun's rays shine on the floor of the house in the vicinity of Washington, D. C. (latitude 40° N.), on January 1, is given in the accompanying table.

Top of windows	Depth of sunshine	Top of windows	Depth of sunshine
Ft. in.	*Ft.*	*Ft. in.*	*Ft.*
3 6	8	6 2	14
4 5	10	7 1	16
5 4	12	7 11	18

FLOOR

As to what kind of floor is best depends on the size and use of the house, on the slope of the land where the house is to be located, and on the soil.

Concrete floors usually are the best for long, permanent buildings, brooder houses, incubator cellars, and all permanent houses where an artificial floor is required and can be built on the ground level. Concrete floors are easy to clean, very sanitary, rat proof, and comparatively inexpensive if gravel and sharp sand are cheap. Keep concrete floors well bedded with straw or some kind of litter, especially in winter, so they will be dry and not too cold.

The floor generally is made of lumber where the floor level will be from 1 to 3 feet above the ground, or where the land is very uneven or sloping. Board floors too close to the ground make rat harbors, and rot out. They should be high enough off the ground to let dogs under, and to permit circulation of air to keep them dry. Portable houses commonly have board floors.

A dirt floor may be used on very light, sandy, dry soils, especially for small, or colony, henhouses. Dirt floors should be from 2 to 6 inches higher than the outside ground surface. It is advisable to take out the old dirt once a year and replace it with fresh sand or fine gravel and earth. Dirt floors harbor rats. Also, they are very dusty when

the hens are scratching vigorously in the litter. Litter does not last nearly so long on a dirt floor as on either a concrete or wood floor.

PARTITIONS

The lower 3 feet of partitions may be solid and the upper portion wire netting, or solid partitions may be used. Partitions extend across the house every 25 to 40 feet, depending on the length of the house. Some solid partitions are necessary in a long house; otherwise the house will be drafty and the birds apt to catch cold.

There should be partial partitions extending out from the back wall of the house at least as far as the front edge of the dropping boards, and solid from floor to roof, and 20 feet or less apart. This prevents a draft on the birds when on the roost at night, and also keeps the birds from overcrowding in one section of the roost.

ROOSTS, DROPPING BOARDS, AND NESTS

The interior fixtures of the pens should be simple, inexpensive, and easy to clean. Roosts and dropping boards may be made removable, but it is simpler and just as satisfactory to make them permanent, with as few cracks and hiding places for mites as possible. The use of carbolineum or a wood preservative of this nature on the roosts and roost supports makes it unnecessary to make these fixtures removable except in the South.

Roosts are usually placed next to the end or back walls, 4 to 8 inches above the dropping boards, while the dropping boards are from 20 inches to 2 feet 9 inches above the floor. The roosts should all be on the same level; otherwise the birds will crowd and fight to get on the highest. Scantlings 2 by 3 inches or 2 by 4 inches with the narrow surface up and upper edges rounded off make good roosts. Seven inches of roost space per fowl should be allowed for Leghorns and 10 inches for Plymouth Rocks or birds of that size, while larger fowls require still more roost space. As many roosts should be used as are necessary to accommodate the fowls comfortably, two roosts generally being used in narrow houses and three, four, and sometimes five in wide houses. Roosts should be placed about 13 inches apart for Leghorns and 15 inches apart for Plymouth Rocks, but the outside ones may be within 10 inches of the edge of the dropping boards.

Nests may be placed on the partition, end walls, or under the dropping boards, but should be high enough above the floor so that the fowls can work under them. They should also be arranged so that the hens can get into them easily. The nests should not be placed under the edge of the dropping board if there is any other place where they can be arranged, as placing them there makes the space under the dropping boards dark and makes the nests more likely to get dirty and more subject to infestation with insects. The nests should be from 12 to 14 inches square and high, depending on the size of the hens, with a strip about 4 inches high on the open side to retain the nesting material. One nest should be provided for every four or five hens.

Trap nests are essential in any careful breeding work, such as pedigree breeding or the breeding of exhibition poultry. A trap

nest is a laying nest so arranged that the hen can not get out of it until released by an attendant.

MATERIALS FOR BUILDING

Wood is the cheapest and most commonly used material for building poultry houses. A building constructed of wood can be moved and torn down, or changed, more readily than one constructed of hollow tile or concrete. Any durable lumber available may be used. The lumber for the outside construction should be well seasoned; otherwise the shrinkage will leave cracks in the walls.

Hollow tile makes a good poultry house, and it can be bought in some sections at a price which, considering its durability, compares favorably with the cost of wood. This construction is well adapted to incubator cellars and brooder houses, or to any buildings requiring double walls and good insulation. It is not desirable for small poultry houses which may be torn down or moved. Houses made entirely of solid concrete are cold and damp.

CONSTRUCTING THE HOUSE

FRAMEWORK

The framework consists of the sills, which support the building; the studs or uprights, which rest on the sills; the plate, which is on top of the studs, and the roof rafters, which rest on the plate.

The sills are placed on posts, stones, or concrete supports, or directly on top of concrete walls.

Wooden floors should be from 1 to 3 feet above the ground. Concrete floors are laid directly on the ground. (The site should be elevated enough so that there is good drainage away from the building.)

Wooden posts should be from 6 to 8 inches in diameter, placed 6 to 8 feet apart, and 2 to 3 feet in the ground or below the frost level. Concrete posts may be used in place of wooden posts, and are much more durable, as wooden posts will rot out after a few years. Cedar, locust, chestnut, redwood, and cypress make the best posts.

Sills may be either 2 by 4 inches, or 4 by 4, depending on the size and construction of the building, 2 by 4 inches being heavy enough for colony houses or those of light, single-wall construction which are not over 10 to 12 feet deep and 4 to 7 feet high. Sills 4 by 4 inches are used for larger buildings and for houses with double walls. Sills 4 by 6 inches are used in two-story henhouses, or other large poultry buildings, and should be set on edge, unless on a concrete or stone wall, when a lighter sill may be used and laid flatwise. Concrete walls are commonly used as foundations for large poultry houses, with a 2 by 4 inch sill, which is bolted to the walls. The posts or supports must be set close together if light sills are used.

Runners 3 by 4 inches, or 4 by 6, are used as sills for portable houses, which require heavy framework. Portable houses which are to be moved on runners must be braced extra well in the corners to stand the strain of moving.

Floor joists may be of 2 by 4 or 2 by 6 inch lumber, depending on the span. They should be from 16 to 20 inches apart. If the span is over 10 feet a center support should be used for 2 by 4 joists.

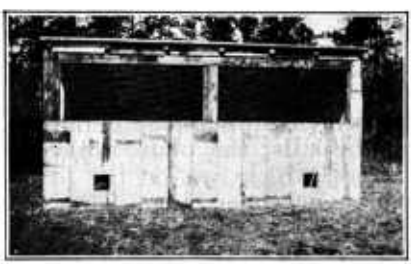
Virginia pine is commonly used for sheathing in the North, hard pine in the Gulf States, and redwood or Oregon pine on the Pacific coast, while local pines of different kinds are available for



Old-style henhouse. No light; no ventilation; poor results



Old shed. Excellent material for poultry house



Open-front henhouse. Shed boarded up in front; poultry-netting windows



Side view of house constructed from old shed



Interior of same house. Good sunlight conditions. 1, Movable roosts; 2, dropping board; 3, nests



Model henhouse constructed from shed at little cost. Note effect of a coat of whitewash

FIG. 7.—How old buildings may be converted into good poultry houses

rough lumber in many sections. Secondhand lumber (see fig. 7), or lumber from large packing or piano boxes, may be used in building small houses, and may often be bought cheaply. Oregon, Georgia, and North Carolina pine, chestnut, and oak are used for sills and runners. Lumber comes in even lengths, usually 10, 12, 14, and 16 feet long. If secondhand lumber is to be used, it is advisable to plan the house according to the length of the lumber. Care should be taken

in ordering a bill of lumber to specify lengths which will cut with the least waste.

To square the corners of a small poultry house, fix one line or side of the proposed house. With this as a base, locate the other corner posts by using the 6, 8, and 10 foot combination, measuring 6 feet from one end of the fixed line and 8 feet from the same end at right angles. The angle between the two lines is fixed by a rule 10 feet long running from the 6-foot mark of the fixed line to the end of the 8-foot line, thereby making a square corner. A triangle whose sides are 6, 8, and 10 feet long, respectively, contains a right angle opposite the diagonal side.

The sill in small buildings may be made level by driving a stick at one corner of the house, to which a straightedge or a long, straight stick is nailed at the desired height of the posts or sill. A spirit level is used on this straightedge to mark the posts at the right height or to make the sill level. A transit is generally used in laying out large buildings.

The studding is toe-nailed on the sill. It should be set plumb with a spirit level and braced well until sheathed. Sills and plates are halved or spliced and nailed together at the joints or ends. These joints should be made over a post or stud. Plates are spiked to the top of the studding. Studding is set from 2 to 4 feet apart for the rear walls and is placed to fit the windows, curtains, and doors in the front and ends. Studs 2 by 4 inches are commonly used. In large houses the corner studs are generally doubled, making them 4 by 4. Two-by-three-inch studs are used sometimes, especially for movable houses, for the sake of weight; the 2 by 3 studs cost practically the same as the 2 by 4, so the only advantage in buying it is its lightness. The studs should be placed so that the lumber, which ordinarily comes in even lengths, will cut with little waste. Less studding is required if the building is boarded up and down rather than horizontally, as in the former case only a few studs with cross-studding or ties are required.

Figure 8 shows a shed-roof laying house, in which the boards are nailed up and down and which has very little studding, as shown in the detailed plans in Figures 17 and 18.

Plates are 2 by 4 inch scantling, laid flat on top of the studs, or 4 by 4 made by spiking two 2 by 4s together.

Rafters may be 2 by 4 inch or 2 by 6. The 2 by 4s are used only in light buildings where the clear span is not more than 12 feet and 2 by 6s for longer spans and in climates where roofs have to bear much snow.

It is advisable to use a purlin in buildings where rafters are more than 14 feet long. Purlins are usually made of 2 by 4 or 2 by 6 inch material set on edge on posts to support the roof. They are placed lengthwise of the house about midway the length of the rafters, which rest on them. In a deep house, which has a wide dropping board, the purlin may be placed at the front edge of the dropping board, so that the posts supporting the purlin will not be in the way in the pens. (See fig. 16.)

In roofs that go up to a comb a ridge board may be placed between the ends of the rafters to keep the ridge straight and even, but this is not necessary in most poultry houses. Collar beams or crossties

1 by 6 inches are used to prevent the spreading of the rafters on gable or combination roofs. They should be placed as low as possible on the rafters, so as to stiffen the frame, but not so low as to interfere with head space. If the hens roost on them, cover them with wire.

In erecting the rafters one pair may be set in position and the rest marked from these. Rafters should be notched only deep enough to make a snug fit and to provide good nailing on the plates. Deep notching weakens them. Rafters are usually spaced 2 or 2½ feet apart, from center to center, so that the sheathing will cut with minimum waste.

FLOORS

Most concrete floors are damp and cold, and therefore must be heavily covered with litter. This is especially true of concrete floors laid directly on the ground. The land should be graded so that the water drains away from the house, as it is absolutely esssential to keep the floor of the poultry house dry.

The best concrete floors are made by first putting down a firmly tamped foundation of cinders, broken stone, or gravel not less than 6 inches thick, and then laying on it from 3 to 4 inches of concrete. A layer of tarred building paper, lapped and cemented with tar at the seams, may be laid between the stone foundation and the concrete to prevent moisture from coming through the earth and concrete and making the floors damp. Care should be taken not to break holes in the paper.

For concrete floors and walls use good-quality Portland cement, which should be kept in a dry place until used. Cement that has become damp and caked is worthless. A concrete foundation wall is always made for a concrete floor. This wall should go down deep enough to be below the ordinary frost depth. Where the wall extends above the ground level a form must be made, which is taken away as soon as the cement hardens.

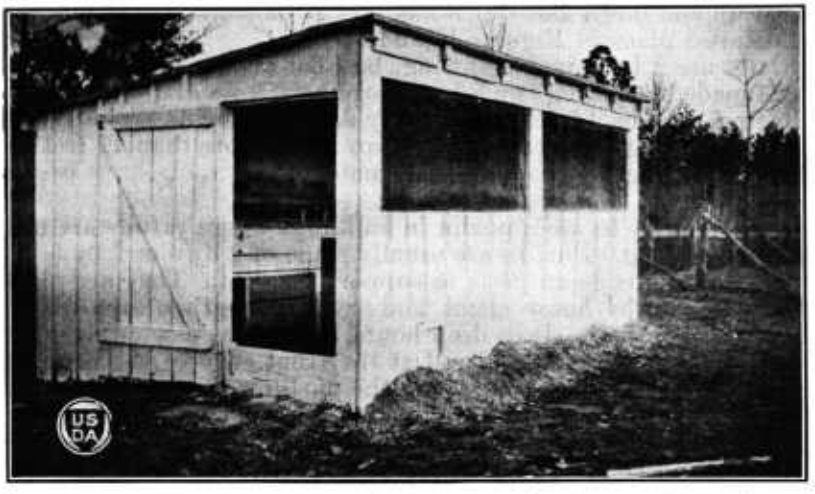


FIG. 8.—Shed-roof laying house of a plan similar to that shown in Figures 17 and 18

The cement should be mixed with clean, coarse sand which does not contain more than 10 per cent of clay or silt and with clean, broken stone or gravel ¼ inch to 1½ inches in diameter. If bank gravel is used, it should be screened through a ¼-inch mesh wire screen and the coarse material left on the screen used as large aggregate. The material which passes through this screen is sifted through a 40-mesh wire screen to eliminate dirt and fine sand. Any material which goes through the 40-mesh wire is thrown away. Sifting bank gravel and remixing the sand and gravel in the right proportions will usually save enough cement to pay for the cost of screening. Detailed information on the use and mixing of concrete is given in Farmers' Bulletin No. 1279, "Plain Concrete for Farm Use."

A mixing platform with a smooth surface and a bottomless box with a capacity of 2 cubic feet for measuring the sand and gravel are necessary for preparing concrete. Spread the sand on the board, add the cement, and mix these thoroughly. Add one-half of the required amount of water, spread the gravel or stone on top of this mixture, and mix thoroughly and add water to the dry spots until the mass is uniform and of the consistency of jelly. A very rough estimate of the quantity of water to use is 4 to 5 gallons for each sack of cement.

Thorough mixing is very essential. The cement should completely coat all particles of the stone and sand. A medium mixture, one that is between wet and dry, is recommended for general use.

One part of cement, three parts of sand, and five parts of stone or gravel make a good plain concrete mixture. One part of cement, two and one-half parts of sand, and five parts of stone or gravel may also be used. These parts are by measure, and a sack of cement contains approximately 1 cubic foot. A one-half inch coating of one part of cement and two parts of sand is usually put on to give a smooth finish to the floor, and should be put on before the base has set. This surfacing material is mixed to the consistency of mortar for laying brick. A moderately smooth surface can be made by working the ordinary concrete smooth with a straight-edged board.

Wooden floors, in most parts of this country, are usually made of one thickness of matched flooring. In the extreme northern sections, they are generally doubled to make them tight and warm, in which case the lower layer of boards is usually laid diagonally with building paper between the floors.

WALLS

The walls of most poultry houses are built of siding or flooring nailed directly to the studs. In the North, siding is usually placed over sheathing, making a wall of two thicknesses of boards, with building paper between; or roofing paper may be nailed on the sheathing. Boards 10 to 12 inches in width, placed vertically, with the cracks covered with battens 2 to 3 inches wide, make a cheap, tight wall. Battens are usually 1 inch thick, and may be either nailed or screwed to the house. They should be nailed to the framework to keep the sheathing from splitting. Matched lumber 1 inch thick is used extensively in poultry-house construction, and makes a very sat-

isfactory wall, without any other covering. Narrow lumber, 2½ to 6 inches wide, is usually used for this purpose, as wide boards are apt to shrink so much as to leave cracks.

The lowest board on the walls should extend far enough over the sill to cover the joint. A tight joint should also be made at the eaves, either by cutting the rafters off even with the rear wall and covering this joint with good roofing paper, or by filling in the space between the rafters with boards. A wide board may be used as the first board on the rafters, allowing it to project from 2 to 4 inches beyond the rear wall, to protect the rear wall of the house. Sheathing should be laid so as to break joints in order to strengthen the building. Siding is usually laid from the bottom upward, and also with joints broken. A shutter may be placed just under the eaves on either the outside or

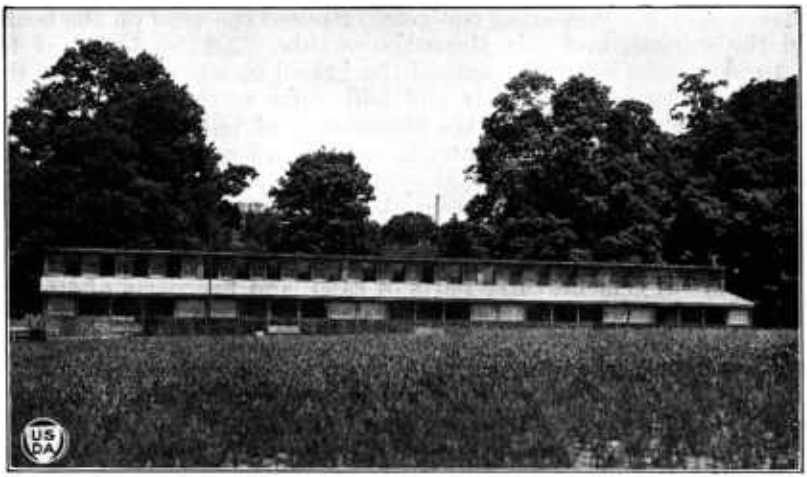


FIG. 9.—A semimonitor style of laying house. This type of roof allows the sun to shine well back into the house, but is more difficult to construct than a single-slope roof. The windows in the upper part of the front make it easy to ventilate and make a cool house in the summer. Care must be used in regulating these windows to prevent drafts in cool weather

the inside of the rear wall for summer ventilation (see figs. 4 and 13). The essential point is to have a rear wall which is tight near the roosts, to prevent drafts from striking the birds.

ROOF

Prepared roofing, laid on wide matched sheathing, is ordinarily used for covering the roof. Wooden shingles are used in only a few sections of the country, principally on the Pacific coast. One or two-ply roofing material is usually used on the sides, and one, two, and three-ply roofing on the roof, although this varies with different styles and grades of manufacture. This prepared roofing may be had in the form of shingles or in rolls, containing directions and materials for laying. The sheathing should be planed on one side and laid close together to present a smooth surface for the prepared roofing. Sheathing paper is sometimes used between the

sheathing and the roofing material. Prepared roofing may be used on roofs which have a slope of 1 or more inches to the foot.

Such roofing will last longer on a roof which has considerable slope than on a roof which has only a slight slope. A shed roof is the easiest one to cover with prepared roofing, which lasts especially well on this type of roof because it has a northern exposure and is not so much affected by the sun. The best way to fasten the loose ends of roofing paper is to bend them under the sheathing, fastening the paper with a narrow wooden board. (See fig. 16.)

Figure 9 shows a semimonitor type of roof on which prepared roofing is used, but this is a more difficult type to construct than the shed roof, because the junction of the lower front roof with the vertical face of the monitor must be constructed so as to make it weather tight. The roofing at this joint should extend 4 inches under the wall or window sill and turn up inside.

Wooden shingles may be laid from 4 to 5 inches to the weather, on roofs which have at least a one-third pitch, which is a rise of 8 inches to the foot, or a total height equal to one-third of the span of a gable roof or two-thirds of the span of a shed roof. Cedar and cypress shingles are usually laid not more than 5 inches to the weather on walls, and are not generally used on roofs which have a rise of less than 8 inches to the foot. Four bundles of wooden shingles are the equivalent of 1,000 shingles 4 inches wide, and estimates are made on this basis. The actual number of shingles may be more or less than 1,000, depending on the width, as shingles vary greatly in width, running all the way from 3 to 10 inches. One thousand shingles laid 4½ inches to the weather will cover about 125 square feet, depending on their size.

In shingling, commence at the eaves or lowest edge by laying a double course. The rest of the layers are single courses. They are laid either to a chalk line, which is made by fastening a chalked cord at the right points at either edge of the roof and snapping it to make a mark for the lower edge of the row of shingles, or to a straight-edged stick. Each shingle is nailed with two nails (4 penny), driven 7 to 8 inches from the butt, depending on the lap, so that the heads of the nails will be covered by the next course. It is advisable to use cement-coated, galvanized, or other rust-resistant nails. Shingles should be laid on narrow sheathing 3 to 5 inches wide, or on common sheathing, and should break joints at least 1 inch and as much more as possible. The sheathing boards should be spaced about 3 inches apart to allow the roof to dry out quickly.

ESTIMATING MATERIALS REQUIRED

Lumber comes in even lengths, usually 10, 12, 14, and 16 feet long. It is figured at so much per 1,000 feet board measure (b. m.), which means the number of square feet which the material would cover if it were 1 inch thick. The number of feet, board measure, in dressed lumber is based on the size of the lumber before it is dressed. The width of matched flooring is usually based on the width of the board before it is dressed and before the tongue and groove have been made. To compute board measure, multiply the width in inches by the thickness in inches, and multiply this by the length in feet, and then

divide this result by 12. The accompanying table shows the number of feet, board measure, in lumber from 6 to 16 feet long, with a cross section varying from 4 to 16 square inches.

Table of board measure

Length	Area of cross section					
	4 inches	6 inches	8 inches	10 inches	12 inches	16 inches
	Board measure					
Feet	*Ft. in.*	*Feet*	*Ft. in.*	*Ft. in.*	*Feet*	*Ft. in.*
6	2 0	3	4 0	5 0	6	8 0
8	2 8	4	5 4	6 8	8	10 8
10	3 4	5	6 8	8 5	10	13 4
12	4 0	6	8 0	10 0	12	16 0
14	4 8	7	9 4	11 8	14	18 8
16	5 4	8	10 8	13 4	16	21 4

Boards less than 1 inch thick are usually sold by the board foot, the price depending on the thickness of the lumber. In estimating lumber, an allowance should be made for waste, adding one-tenth for common sheathing, one-fifth for matched lumber 6 inches wide, one-fourth for matched siding or lumber 4 inches wide, and one-third for matched flooring 3¼ inches wide.

A working plan of the building should be drawn to a convenient scale, usually one-fourth inch to the foot for poultry houses, showing the ground plan, the front elevation, and the end or a cross section of the house. The bill of materials can be worked from the plan.

Wire nails are generally preferred in construction, as they are easier to use than cut nails, although the latter have greater holding power. Use 10 to 20 penny nails for framing, 8 to 10 penny for sheathing, 8-penny for siding, and 6-penny finish or casing nails for clapboarding. Four-penny nails are 1½ inches long, 6-penny are 2, 8-penny are 2½, 10-penny are 3, and 20-penny are 4 inches long. It takes about 5 pounds of 4-penny nails to 1,000 shingles; 18 pounds of 6-penny for 1,000 square feet of beveled siding; 20 pounds of 8-penny and 25 pounds of 10-penny for 1,000 square feet of sheathing; 30 pounds of 8-penny for 1,000 square feet of flooring; and 15 pounds of 10-penny and 5 pounds of 20-penny for the studding in 1,000 square feet of frame wall.

A cubic yard of 1:3:5 concrete will take 4.64 sacks of cement, 0.52 cubic yard of sand, and 0.86 cubic yard of gravel. A cubic yard of 1:2 mortar surface will take 13.48 sacks of cement and 1 cubic yard of sand. One hundred square feet of a 3-inch concrete floor made of a 1:3:5 mixture will take 4.5 sacks of cement, 0.5 cubic yard of sand, and 0.83 cubic yard of gravel. A similar half-inch area of surface mortar of a 1:2 mixture will take 2.12 sacks of cement and 0.15 cubic yard of sand. A concrete wall can be made entirely of rough concrete, making the wall 6 inches wide and at least 2½ feet high, the top of the wall being level with the top of the floor. The bottom of the wall should go below frost depth.

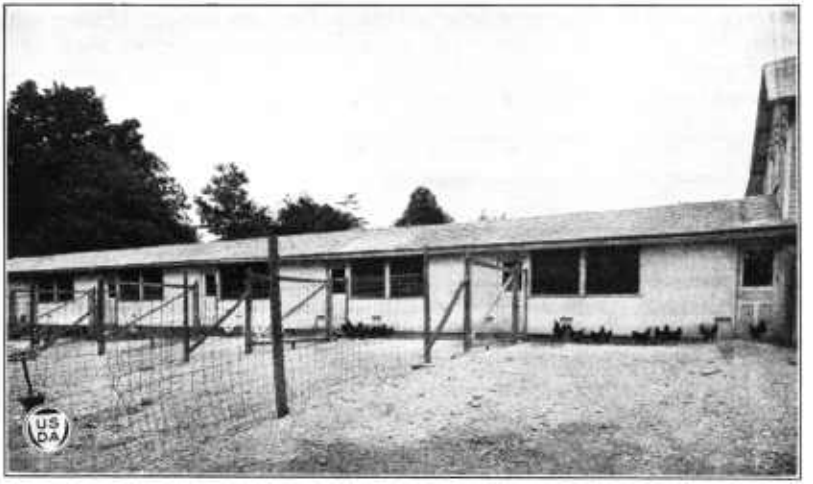


FIG. 10.—Laying house used at U. S. Experiment Farm, Beltsville, Md. Capacity, 500 hens. Plans shown in figs. 11, 12, and 13

PAINT AND WHITEWASH

Painting adds greatly to both the appearance and durability of all buildings and appliances. All surfaces should be clean and dry before they are painted. Use a priming coat made of about equal parts of paint and linseed oil and cover with one or more coats of paint, which should be thoroughly brushed into the wood.

Whitewash is cheap and may be used both inside and out. It is made by slaking quicklime in water. The lime should be placed in a vessel and water poured over it, covering the vessel with cloth or

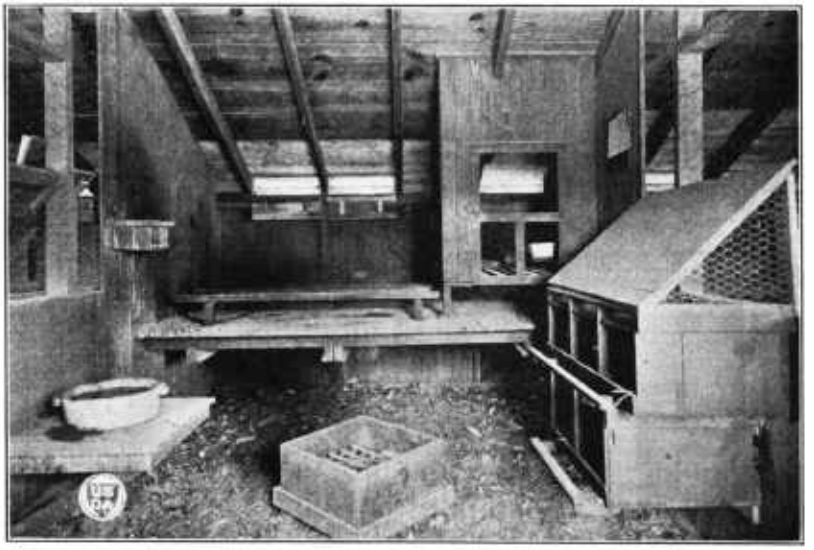


FIG. 11.—Interior of pen in laying house used at U. S. Experiment Farm, showing roosts, dropping board, and broody coop in the rear of pen and nests on the right partition. A dry-mash hopper is shown in the center of the pen and a water pan on the left partition. (See Fig. 10 for exterior view.)

burlap, and allowing the lime to slake for one hour. Water is then added to bring the whitewash to a consistency which may be applied readily. Whitewash is spread lightly over the surface with a broad brush, or may be put on with a spray pump.

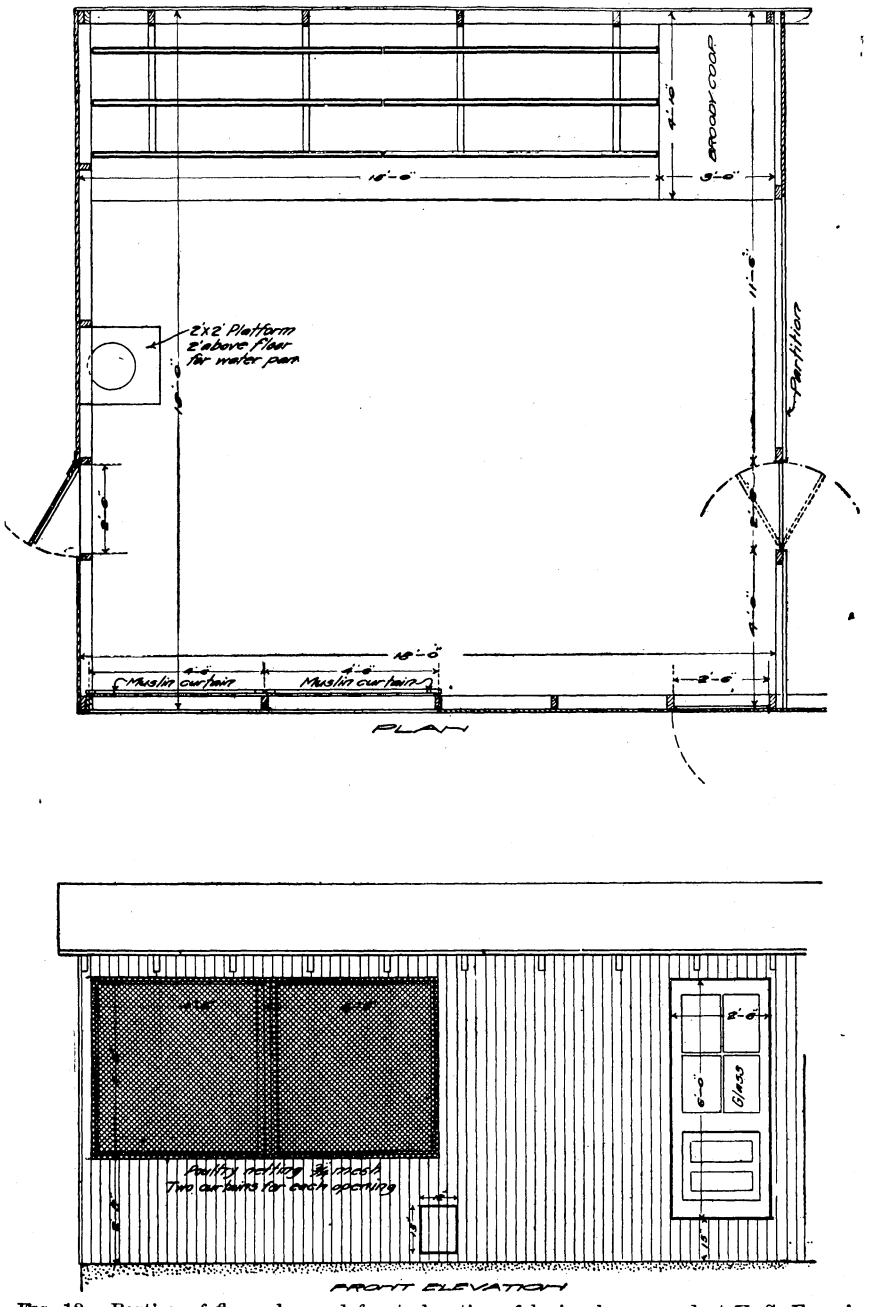


FIG. 12.—Portion of floor plan and front elevation of laying house used at U. S. Experiment Farm, Beltsville, Md. Capacity, 500 hens.

Interior whitewash may be made in the following manner: (1) Slake 1 bushel of quicklime with 15 gallons of water; (2) beat 2½ pounds of rye flour in ½ gallon of cold water and then add 2 gallons of boiling water; (3) dissolve 2½ pounds of common rock salt in 2½ gallons of hot water; mix 2 and 3, then pour into 1, and stir until thoroughly mixed.

A weatherproof whitewash for exterior surfaces may be made as follows: (1) Slake 1 bushel of quicklime with 12 gallons of hot water; (2) dissolve 2 pounds of common salt and 1 pound of sul-

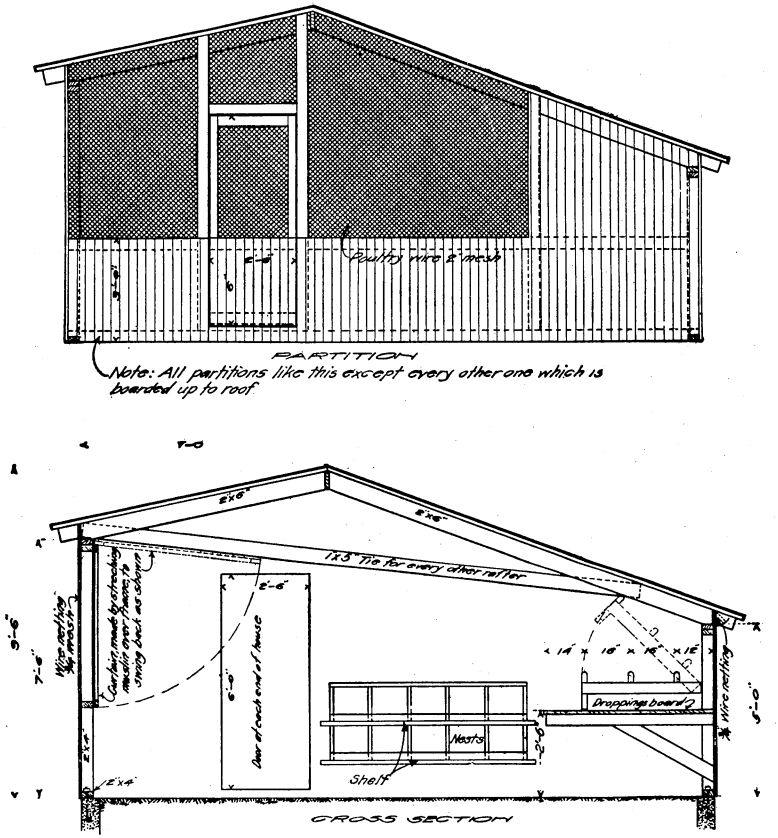


FIG. 13.—Partition and cross section of laying house used at U. S. Experiment Farm at Beltsville, Md. Floor may be of concrete or earth, but the former is better. Capacity, 500 hens. (See Fig. 12.)

PLANS AND BILLS OF MATERIALS

phate of zinc in 2 gallons of boiling water; pour 2 into 1, then add 2 gallons of skim milk, and mix thoroughly.

Figure 10 shows a long laying house, capacity, 500 hens, in use at the United States Experiment Farm, Beltsville, Md. This house is equipped with trap nests, which are illustrated in Figure 11. Figures 12 and 13 show the details of this house. It has a combi-

nation type of roof. The bill of materials, including a concrete floor and foundation walls, is as follows:

Bill of materials for laying house 18 by 108 feet

Lumber	Size	Number of pieces	Length	Board measure
	Inches		*Feet*	*Feet*
Sills	2 by 4	30	12	240
Plates	[1] 2 by 4	44	12	352
Ties for rafters	1 by 5	30	16	220
Rafters	2 by 6	56	14	784
Do	2 by 6	56	10	560
Studs	2 by 4	38	12	304
Studs (front)	2 by 4	28	8	150
Roosts	2 by 3	36	8	144
Total				2,754

	Feet
Sheathing surfaced one side for roof	2,860
Matched flooring for walls, partitions, and dropping board	3,200
Boards planed both sides for nests	300

[1] Doubled

186 bags of cement, 43.5 cubic yards of unsifted gravel, and 33 cubic feet of sand, for floor and walls. 340 running feet of 1 by 3 inch furring for curtain frames. 300 square feet of ¾-inch mesh wire for front. 300 square feet of 2-inch mesh wire for partitions. 350 square feet of muslin cloth for curtains. Prepared roofing paper to cover 2,700 square feet. 8 outside doors. Hardware (hinges, nails, staples, etc.). Concrete wall or posts (either concrete or wood) for foundation. If posts are used, the sill should be 4 by 4 inches instead of 2 by 4 inches, thus doubling the number of feet (board measure) required for sills.

Figures 14, 15, and 16 show detailed plans of one-half of a shed-roof laying house 20 by 80 feet, which has capacity for 400 fowls of the general-purpose type, or for 500 Leghorns. This is one of the simplest and most inexpensive types of house to construct, and one of the most practical for large commercial poultry farms. The depth makes this a very comfortable winter house. The house can be made any length, long enough to hold 1,000 to 1,200 hens if desired, but this is as many as it is advisable to keep in one house. This

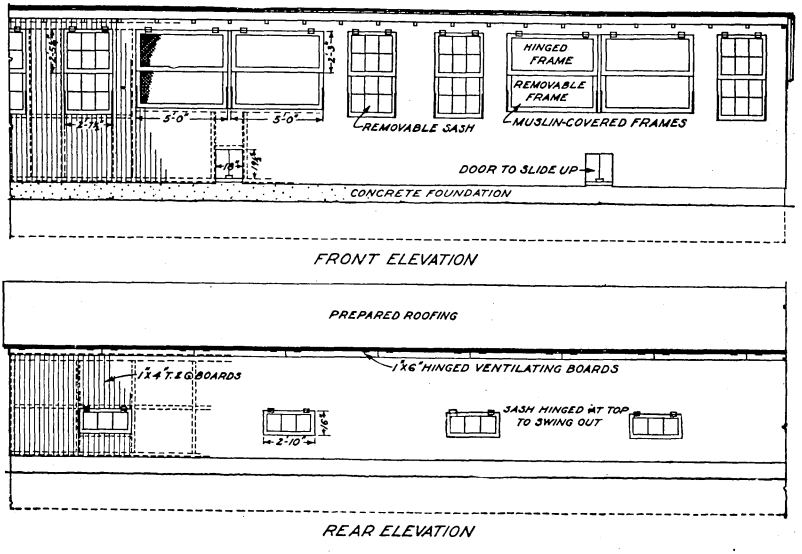


FIG. 14.—Front and rear elevation of shed-roof laying house, 20 by 80 feet, capacity 400 to 500 hens. (See figs. 15 and 16.) Bill of materials shown on page 23.

house is divided into pens 20 by 40 feet each, the partitions serving to keep the hens in smaller flocks and also helping to prevent drafts.

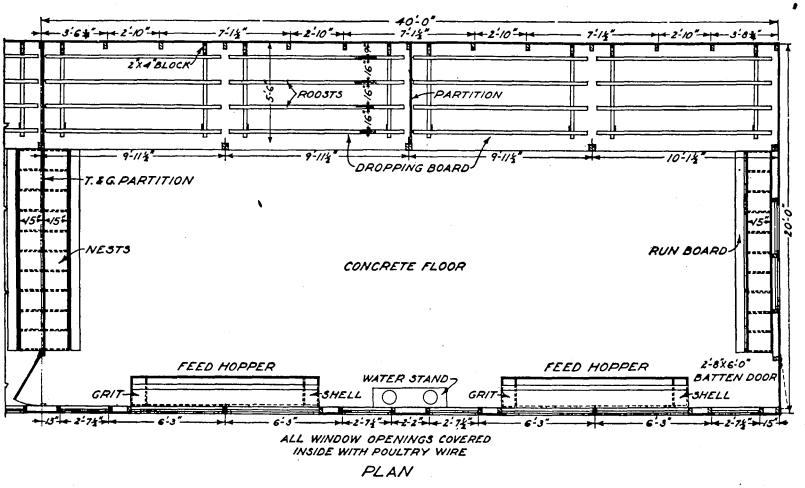


FIG. 15.—Plan of shed-roof laying house shown in Figure 14. This house is 20 feet wide and can be built any length desired

Bill of materials for shed-roof house, 20 by 80 feet, as shown in Figures 14, 15, and 16.

Lumber	Size	Number of pieces	Length	Board measure
Framing:	*Inches*		*Feet*	*Feet*
Sills	2 by 4	24	10	160
Rear studs	2 by 4	14	10	93
Front studs	2 by 4	32	8	171
End studs	2 by 4	6	12	48
Posts	4 by 4	4	12	64
Purlins	2 by 4	16	10	107
Plates	2 by 4	32	10	213
Rafters	2 by 6	44	16	704
Rafters	2 by 6	22	12	264
Horizontals	2 by 4	24	10	160
Dropping board	2 by 4	8	10	53
Studs, partition	2 by 4	3	8	16
Horizontals, partition	2 by 4	2	10	13
			Lin. ft.	
Roosts	2 by 3		400	200
Vent board, surfaced, four sides	1 by 6		80	40
Eave strip	1 by 2		186	31
Fascia on rafters	1 by 6		82	41
Frame for curtain	1 by 3		240	60
Tongue-and-groove roof sheathing	1 by 6			2,000
Tongue-and-groove flooring (covering)	1 by 4			1,400
Tongue-and-groove flooring (dropping board and small partitions)	1 by 4			650
12-inch boards, surfaced four sides, for nests, etc				650
Tongue-and-groove flooring (partitions)	1 by 4			375
Total feet board measure				7,513

304 square feet 2-inch mesh poultry wire.
160 square feet muslin for frames.
Roof covering for 1,800 square feet area.
12 cellar sash, 3 lights, 10 by 12 inch glass.
16 sash, 6-light, 10 by 12 inch glass.
29 pairs 2-inch galvanized butts for cellar sash and vents.
16 pairs 2½-inch galvanized butts for other sash and frames.
3 pairs 5-inch T hinges for doors.
20 ½-inch diameter foundation bolts 16 inches long, with nuts.
Concrete: Foundation, 70 sacks Portland cement, 7.6 cubic yards sand, 12.6 cubic yards gravel; floor, 96 sacks Portland cement, 10.4 cubic yards sand, 17.2 cubic yards gravel.
Nails, paint, etc., as required.

The yard for commercial laying flocks should be the full length of the house, and about 125 feet deep, one such yard in front and one in the rear of the house. No partitions are necessary in the yards for laying flocks, as the hens will distribute themselves through the

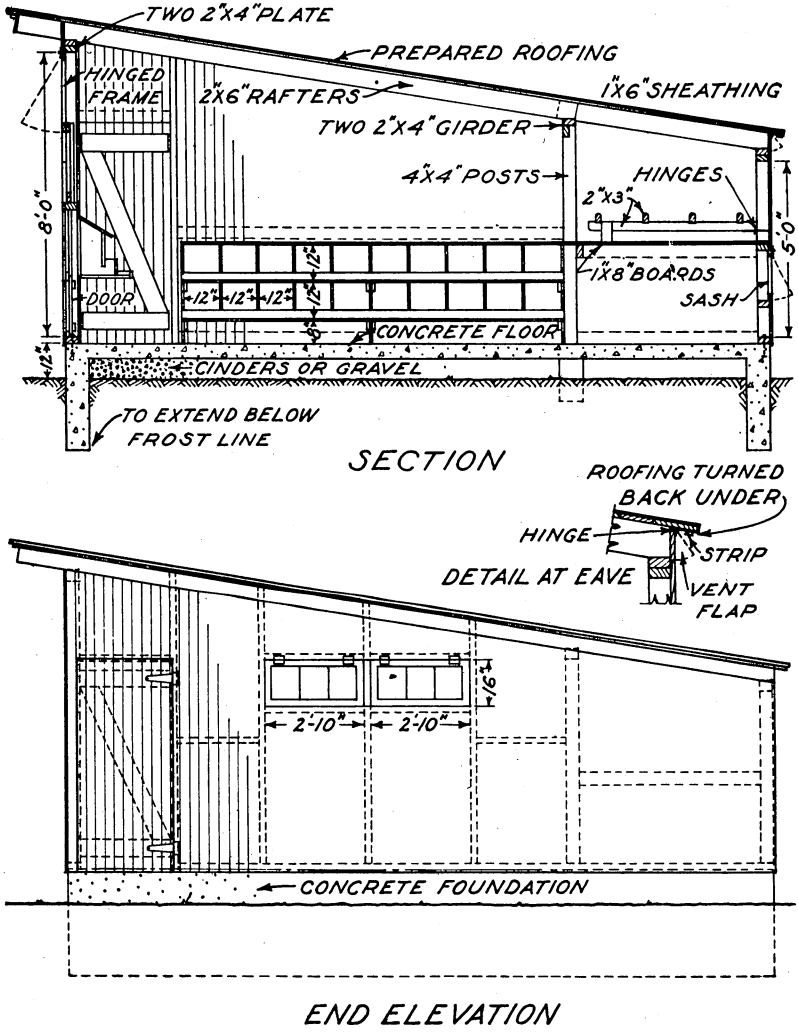
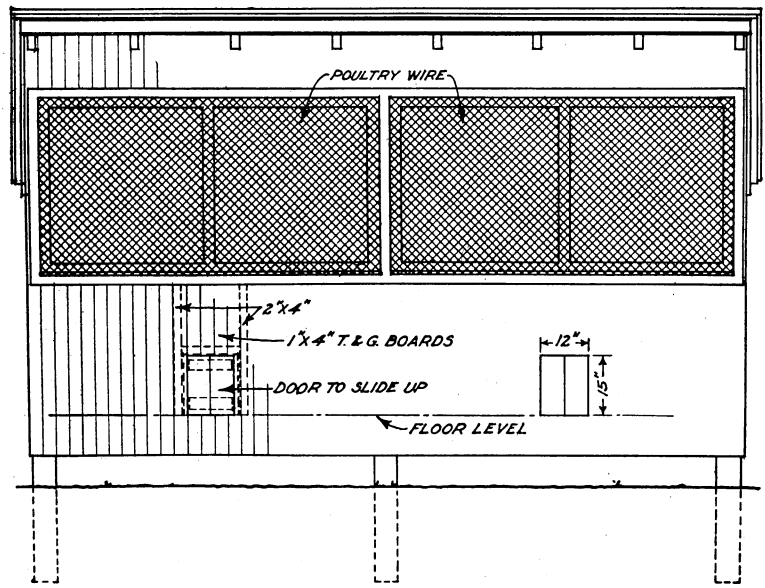


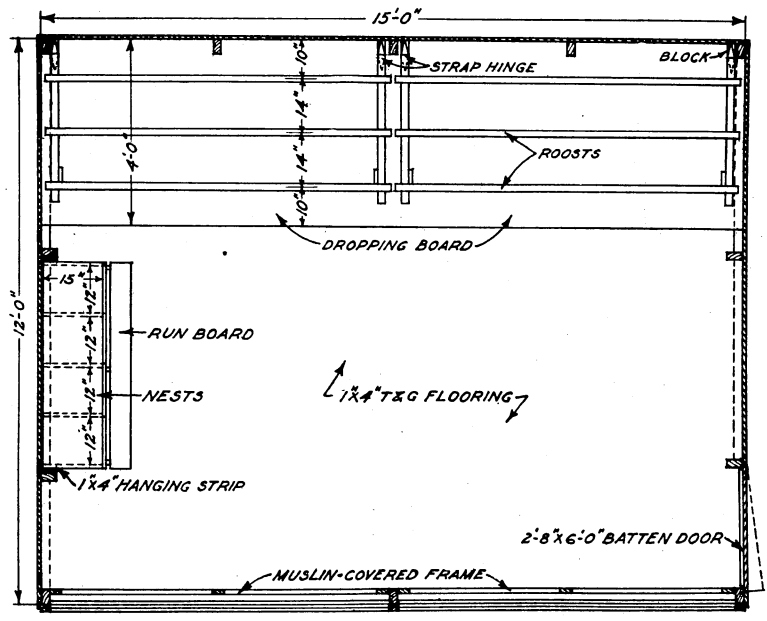
FIG. 16.—Section and end elevation of large shed-roof laying house shown in Figures 14 and 15

pens, even though all are allowed to run in one yard. Hens will tend to congregate at the end of the house where feeding is begun, so it is desirable to begin feeding at opposite ends of the house on alternate days to keep the hens more evenly distributed throughout the house.

Figures 17 and 18 show detailed plans of a simple type of shed-roof laying house, 12 by 15 feet in size, with capacity for 60 hens.

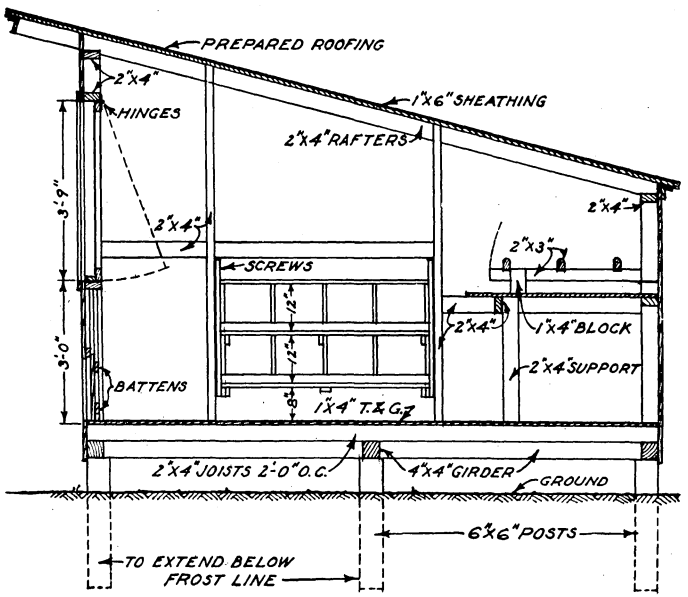


FRONT ELEVATION



PLAN

FIG. 17.—Front elevation and plan of simple shed-roof laying house for 60 hens, adapted for a general farm or a large back-yard flock. (See fig. 8.) Bill of materials shown on page 27



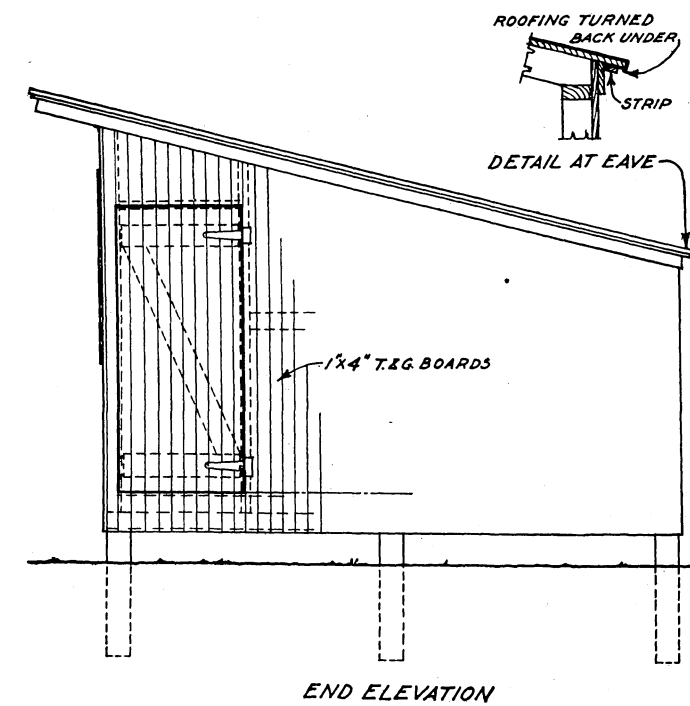


FIG. 18.—Section and end elevation of laying house for 60 hens. If used in the North, reduce curtain space and insert one good-sized window

A house of this general type is illustrated in Figure 8. This house is boarded up and down, and only a small amount of framing material is used. The bill of materials follows:

Bill of materials for laying house for 60 hens, as shown in Figures 17 and 18

Lumber	Size	Number of pieces	Length	Board measure
Framing:	*Inches*		*Feet*	*Feet*
Girders	4 by 4	3	16	64
Do	4 by 4	2	12	32
Floor joists	2 by 4	9	12	72
Studs and horizontal bridging	2 by 4	7	10	47
Do	2 by 4	11	8	59
Roof rafters	2 by 4	8	14	75
Plates	2 by 4	2	12	16
Dropping board	2 by 4	1	16	11
Roosts	2 by 3	4	14	28
Nests, smooth surfaced four sides	1 by 12	3	12	36
			Lin. ft.	
Trim, surfaced four sides	1 by 6	----------	60	30
Under roof	1 by 2	----------	104	18
Canvas frames, surfaced four sides	1 by 3	----------	60	15
Tongue-and-groove sheathing	1 by 6	----------	----------	220
Tongue-and-groove flooring, sides, and dropping board	1 by 4	----------	----------	600
9 posts, 6-inch diameter, 2 feet 6 inches long; may be of locust, cedar, creosoted wood, tile filled with concrete, or concrete blocks				
Total feet board measure	----------	----------	----------	1,323

16 linear feet 2-inch mesh galvanized poultry wire 4 feet wide.
60 square feet muslin cloth for frames.
Prepared roofing for 224 square feet area.
Hinges, fasteners, nails, paint, etc.
Battens, etc., provided under sheathing.

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September 11, 1924

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