based on recorded analyses of corn at different stages, and approach those given in Henry & Morrison's "Feeds and Feeding" for corn at the stage of maturity reached by these different corns.

The results of six years of work with silage corn at this Station, supported by the results secured from two years of co-operative work, are sufficiently conclusive to warrant drawing certain conclusions.

A vigorous, heavy-yielding variety of silage corn is desired, but a goodly percentage of the ears should reach the glazed to dent stage in average years. A large-growing, late-maturing corn will not mature sufficiently, and the early-maturing corn will not produce the tonnage. Since acclimating a variety of corn to Western Washington generally means earlier and earlier maturity, consequently diminished vigor, shortened stalk and reduced gross yield, it would seem a desirable practice in most sections of Western Washington to secure seed for silage corn from a section where the growing season is somewhat longer than ours. Seed corn grown just north of the 45th parallel in South Dakota, Minnesota or Wisconsin is worthy of extensive trial. Seed grown much farther south or under other conditions having a long, hot growing season, such as Prosser or Yakima, requires too long a growing season to be suitable for Western Washington conditions.

THE PUYALLUP LAYING HOUSE.

Geo. R. Shoup, Poultryman.

In devising plans for the ideal laying house for Western Washington conditions, the endeavor has been to construct a building which will provide, besides roosting and nesting quarters, all necessary equipment to make conditions inside the building during the fall and winter a duplicate of those prevailing during the spring when production is normally highest. The general type of building illustrated and described in this article has been in use on this coast for several years, and as far as we know has always proved satisfactory and actually provides conditions which make possible a maximum egg yield from mature pullets during the period of highest prices.

We have outlined twelve features of a laying house which we believe essential for continued success, and which if provided should assure to the careful and willing caretaker a certainty of satisfactory fall and winter egg production.

(1) Arrangement of entire plant to provide for convenient and efficient feeding, and handling of the litter and droppings.

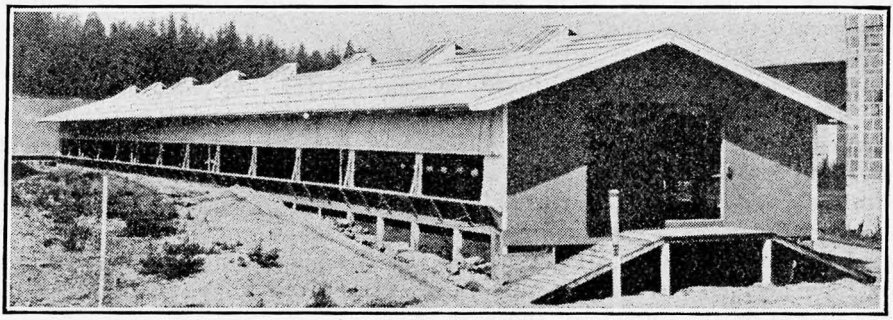
(2) Position as to prevailing winds and winter sunshine. Most localities in Western Washington have certain prevailing winds. Some of the Sound country has an occasional "northeaster" in winter and a southwest wind in summer. This permits facing the coops southeast, which is the ideal frontage, because the early morning sun shines in and all thru the coop, purifying the air, killing disease germs and livening up the layers fully two hours ahead of the popular south-exposure house. Face the building to have the worst winter winds on the boarded side and end, and to admit the most winter sunshine possible.

(3) Drainage of adjacent land if yards are used for pasture in the wet weather. A location should be selected so that the yards will drain away from the coops. Stagnant water in chicken yards is a frequent cause of

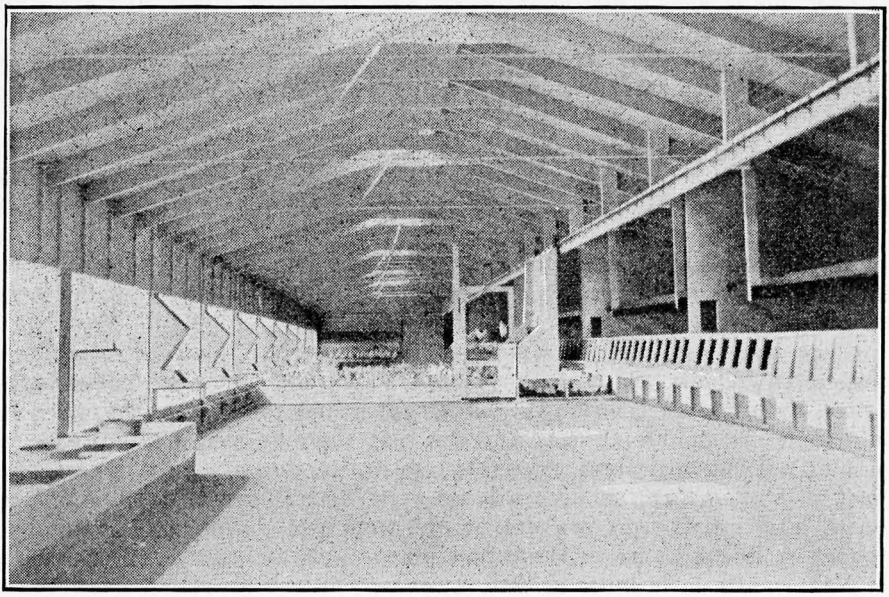
disease infection, and is hard to prevent if the coop is built on a flat prairie with a clay or moisture-holding soil. Green pasture is not considered necessary for Leghorn pullets if the supply of kale, mangels and lawn clippings is sufficient and continuous.

(4) The building should be so constructed that birds will never suffer from extremes of temperature. It must be warm enough in winter to prevent the combs and wattles from freezing, and it must have sufficient air circulation in summer so that birds working on the floors or laying eggs in the nests are not overcome by excessive heat.

(5) All ventilators must be under the control of the operator, to correct as far as possible unfavorable wind and moisture conditions. A severe wind on working birds makes them uncomfortable and causes them to hover together for warmth and waste time. A continuous draft on sleeping birds



View of laying house at Western Washington Experiment Station. This house is 130x20. Capacity, 1,000 birds. Curtain partially raised.



Interior view of laying house shown above.

is presumed to cause colds. Hence the roosting closet must be airtight on all sides except that facing the front opening.

(6) The floor must be thoroly lighted from both front and rear to prevent the litter being piled up against the rear wall, as is always the case when front light only is used.

(7) There must be no obstructions on the floor or base of the walls to block the scrapers when cleaning the floor. Hence all equipment must be attached to the walls without braces underneath, or else be suspended from the ceiling.

(8) The building must be as nearly mite-proof as possible. There must be no strips fastened on the rear wall or ends of the roosting closet and no studding or up-and-down 2x4s used in the construction, because such construction makes a certain and safe place for mites to accumulate. The roosts must be suspended rigidly from the ceiling and have no contact with the droppings boards or walls, to prevent mites from crawling down underneath the droppings boards.

(9) An inside dustbath must be provided wherein the birds can dust and also secure mud to eat. Both are essential for their health.

(10) **Roller Curtain.** Glass is a very good conductor of heat. Too much glass will allow the slight amount of heat given off by the hens to escape in the winter time, and transmits too much heat in summer, so substitute thin muslin whenever practicable. The muslin curtain over the front opening should be so arranged that it is quickly raised or lowered, and when lowered should prevent all drafts and rain from entering. When raised it must be protected from dust and rain. Hence our adoption of the roller type placed on the outside of the wire front.

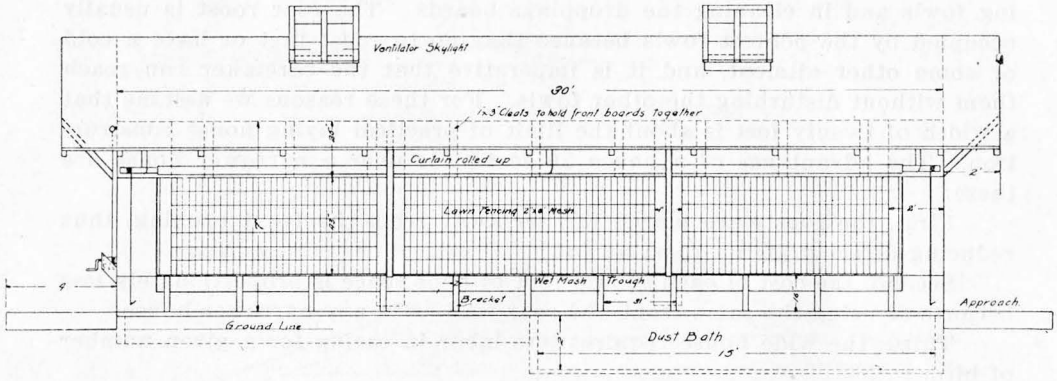
(11) **Hard-Surface Floors.** Where birds are confined entirely to the laying house and not allowed out in the yard during the fall and winter, it is very necessary that every part of the coop be kept reasonably clean. It is impossible to keep a dirt floor clean. The droppings, straw, dirt and grain eventually mix together for several inches of depth. If there are disease germs in this filth some of the grain becomes infected and ailing birds are inevitable. Hence intensive poultry work requires a smooth, hard-surface floor—boards, concrete or asphalt.

(12) The last essential for successful poultry house construction, as we see it, is the necessity of dispensing with the use of superfluous material. All studding and plates, which are ideal breeding places for mites, where dust and dirt accumulate and which always make the inside of a poultry house look unsightly, are entirely eliminated. By this means we greatly lessen the cost, and improve the appearance and efficiency without impairing the durability.

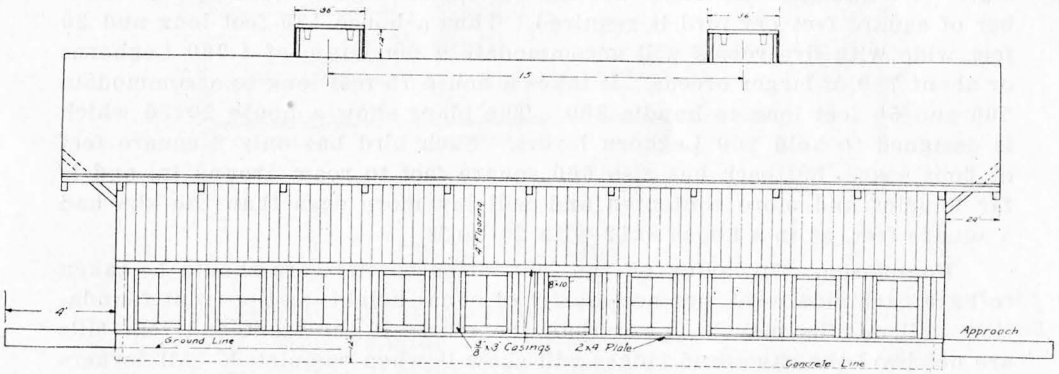
The plans can best be worked out on paper first, where changing is easy. Many plants are seriously hampered by the wrong grouping of the various buildings in relation to water supply and the feed house when the time comes to double the present size. If there is any possibility of developing a 1,000-bird plant, take this into consideration when the first small house is built. Small houses are specially desirable for special breeders' houses later on, if they are not on the land which should be used for a brooder or laying house of the larger plant.

If a nearly level building site is convenient and gravel is obtainable at not too great a cost, we recommend cement floors for poultry houses. A

cement or concrete floor need be only two inches thick and the cost is practically the same as for a good board floor with its attendant joists, sills and foundation. The cement floor is absolutely rat proof, is far easier cleaned than a board floor, and will last forever. A board floor must be raised at least sixteen inches above the ground to be certain of not affording a harbor for rats. The rat pest is a serious one, some authorities claiming that a rat will eat 60 cents worth of grain a year. They are also among the best known breeders of fleas, and have an unlimited capacity for destroying young chicks. One advantage of a board floor is that the ground on which the coop is built need not be level, as the unevenness may be accommodated by different



FRONT ELEVATION OF LAYING HOUSE



REAR ELEVATION OF LAYING HOUSE

heights of supports or posts. A cement floor building can never be moved; it's there for keeps, whereas the board floor coop can be readily moved if constructed with sufficiently strong sills.

The pullet laying house should be constructed with the idea of housing at least twice as many layers as the entire balance of the plant. This proportion of one breeder to two pullets is about the limit of old birds that can be profitably carried through the moult by the laying pullets, and this proportion of breeders is required to reproduce the new pullets, which should be handled if possible in a single hatch, or at most in two hatches. The fewer units of the pullet flock the easier the housing and caring for the same.

It is preferable for this house to have only two yards, to be used alternately, of an area large enough to supply green pasture during the spring and summer. The breeders' houses because of the necessity of smaller pens should be narrower, thus permitting the subdivision of the available pasture into sufficient yards to handle the various groups.

A pullet laying house twenty feet wide if constructed along the lines suggested in this article will house all the pullets which can be comfortably perched on five roosts extending the entire length of the house. Five rows of parallel roosts require a droppings board at least 5 feet 8 inches wide, with roosts placed twelve inches apart center to center. We find that this width is about the limit of efficient handling both in reaching for roosting fowls and in cleaning the droppings boards. The rear roost is usually occupied by the poorest fowls because they go to roost first or have a cold or some other ailment, and it is imperative that the caretaker can reach them without disturbing the other fowls. For these reasons we assume that a width of twenty feet is about the limit of practical laying house construction. The advantages of a house 20 feet wide over a narrower house are these:

First, the roosts are placed farther away from the front opening, thus reducing direct draft on roosting fowls.

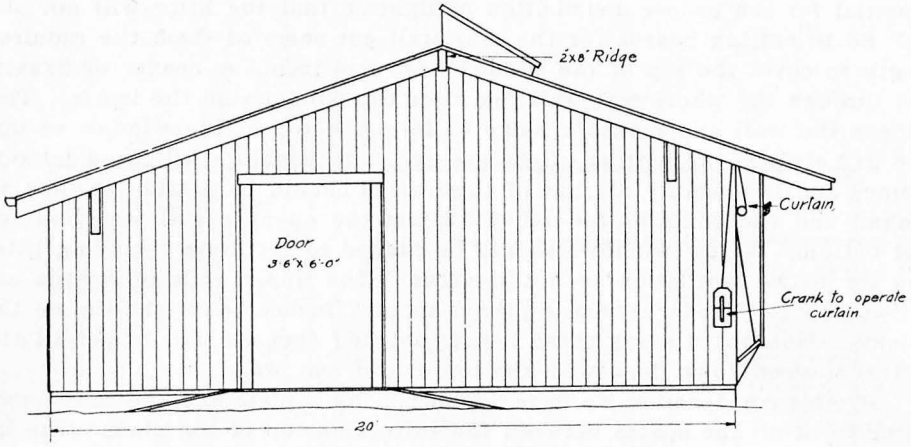
Second, the cost of each square foot of floor space is proportionately less because of using the same front and rear wall as in any narrower house.

Third, the wide house requires less labor in caring for a given number of birds.

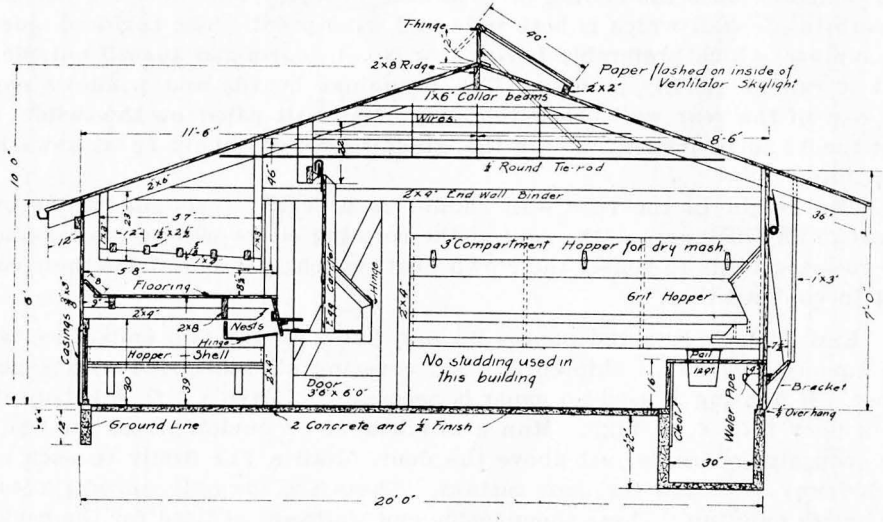
Assuming that we have determined on a twenty foot width we determine the length necessary to house the prospective layers by a sort of sliding scale. We find that the larger the non-partitioned laying room the less number of square feet per bird is required. Thus a house 130 feet long and 20 feet wide with five roosts will accommodate a maximum of 1,000 Leghorns or about 750 of larger breeds. It takes a house 75 feet long to accommodate 500 and 50 feet long to handle 300. The plans show a house 20x30 which is designed to hold 200 Leghorn layers. Each bird has only 3 square feet of floor space, but each has also 600 square feet to roam around in, and is far happier and more contented and will lay more eggs than tho she had 5 square feet, as in a house 8x12 with 20 birds.

Foundation. In laying off the foundation special care should be taken to have each side level, not necessarily of equal height, as the front foundation wall or sills may be lower than the rear. If the front and rear sills are not level the eaves and ridges will show it when completed. All corners should be laid off at right angles because if the corners are not square the flooring has to be ripped to fit and much time is wasted in making the coop weatherproof. A convenient and accurate way of securing square corners is to measure 8 feet from a corner on one side and 6 feet on the adjoining end; then the hypotenuse of this triangle, if the corner is square, is 10 feet. This 6-8-10 rule is very handy when logs or uneven timbers are used for sills and when there is no chance for accurate work with a square. A built-up sill of 2x4s spiked together breaking joints is quite satisfactory for chicken coop work, or a 2x4 imbedded in the cement where a concrete foundation wall is used.

The concrete foundation wall is the ideal in any type of chicken coop construction. If made 12 inches below the surface of the ground with a



END ELEVATION OF LAYING HOUSE



CROSS SECTION

base a few inches wider it is absolutely rat proof. It will also prevent any surface water from running into coops in case of heavy rains or melting snow. A cement wall if supporting a board floor should be made with ventilating holes at frequent intervals to allow air to circulate under the floor and prevent dry rot of the timbers.

Rear Wall. In this climate the double wall construction is not necessary, and it is best to avoid it whenever possible. The double wall offers a convenient harbor for rats and mice as well as our old friend, Mrs. Mite.

Since the double wall is an expensive luxury, we advise doing away with the studding (the up-and-down 2x4s) entirely. To accomplish this we run the boards up and down. Along the top of the floor ½-inch from the outer edge a 2x2 strip is nailed all the way around. To this strip the boards are nailed at the botton, extending ¼-inch over the edge of the floor and resting on it. We insist that rear windows under the droppings boards are

essential for the proper distribution of light so that the litter will not pile up. So in cutting boards for the rear wall cut some of them the required length to cover the top of the window sash one inch. A header of 2x4s is run through the whole rear wall just over the windows on the inside. This stiffens the wall and makes a ledge to form the top of the window casing. The 2x2 strip is the bottom of the casing. The windows will need no side casings, as the opening cut out of the boards should be a trifle smaller all around and the windows toe-nailed against the opening with one nail top and bottom. A few windows should be hinged to facilitate removing litter and for extra ventilation in hot weather. The upper ends of boards are nailed to a 2x4 binder which is placed about 7 inches below the top on the outside. One board every three feet is notched deep enough to permit the rafters to drop down flush with the top of the rear wall.

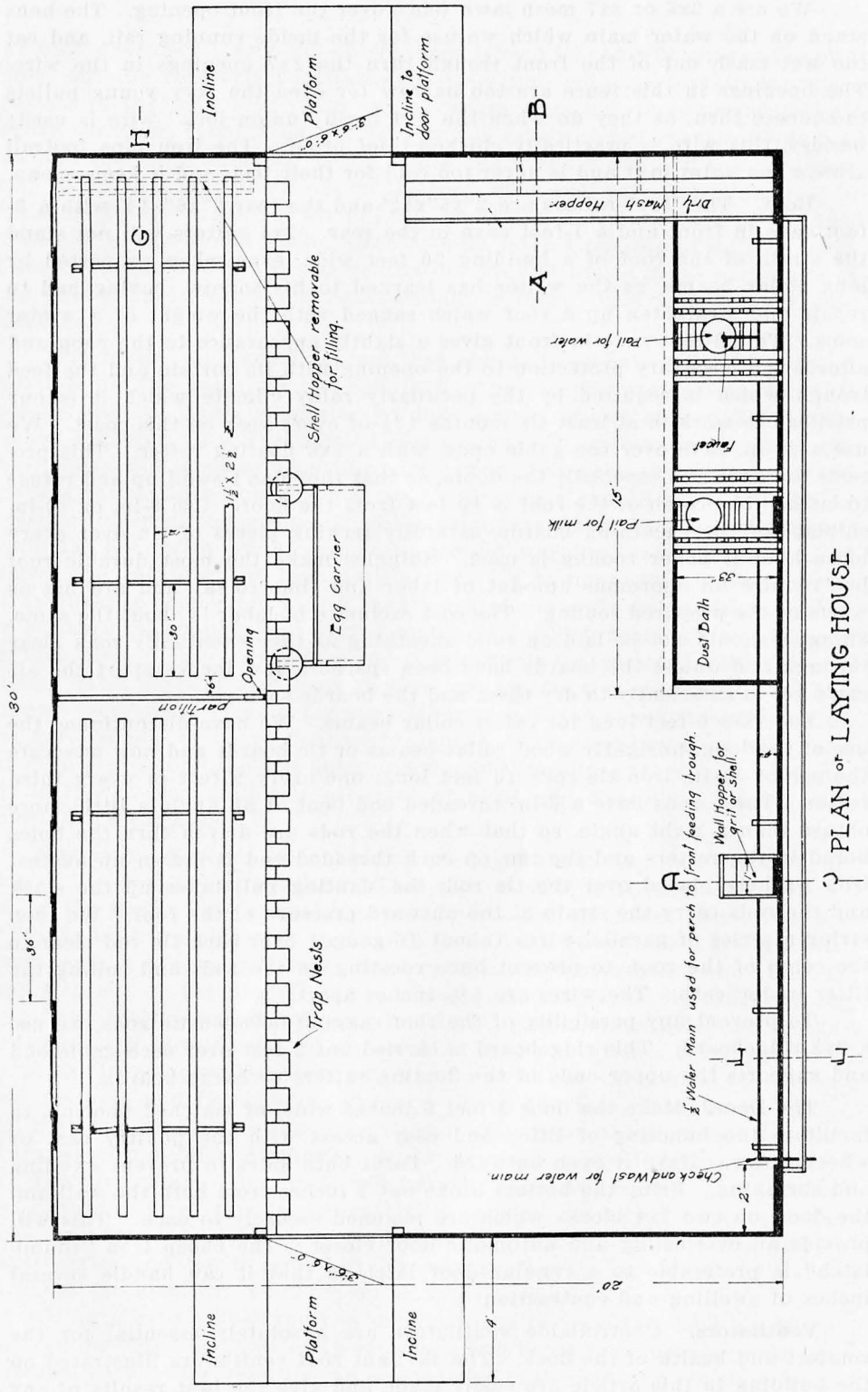
By this construction we have avoided using a plate and the consequent filling in of all the spaces between the rafters on top of the plate. The inside of wall is then covered with a strip of light weight asphalt paper. This paper is brought up 2 inches above the rear wall so that it can be cleated and cemented onto the ceiling or sheathing boards. This makes a perfectly smooth inside wall which is both mite and wind-proof. The surfaced side of the lumber, which preferably is No. 3 or No. 4 flooring, is turned outside so that it can be readily painted. The droppings boards and windows cover the rest of the rear wall below the strip of asphalt paper on the inside, except the 12 to 15 inches between the windows, which should be whitewashed or painted.

The height of the rear wall should be 6 feet. It should not be over 6 feet in any instance, as the roof of the roosting closet will be too far above the roosting birds to reflect their own heat, which is essential for their comfort in cold weather.

End Walls. Run the boards up and down on the two ends also, with the smooth side out if shiplap is used, covering all the inside with asphalt paper. If flooring is used no paper is necessary. Leave a 3 ft. 6 in. opening for a door 6 ft. 6 in. high. Run a 2x4 header or binder across the end of the coop on the inside just above the door. Nail a 2x4 firmly to each side of doorway to stiffen the door casings. These are the only upright 2x4s in the entire building. These sheer inside end walls are utilized for the back of the feed hoppers, which are built into the building on each end. Have a door at each end so you can pass thru the coop and not disturb the fowls by retracing your steps.

Front Wall. The front wall is 7 feet high. It consists of one 12-in. and one 4-in. or two 8-in. shiplap at the bottom, a 43-in. opening the entire length, and four 8-in. shiplap cleated together one above the other at the top. The 7-in. rafter notches are cut in the top board every 3 feet to correspond with the rear notches.

These boards should be 20 feet long, so that joints will come where the 1x12 uprights are placed every 10 feet. By using 1x12 boards instead of 2x4s for front supports we secure the inside and outside finish corresponding to the rest of the building. A 1x12 about 43 inches long is securely nailed to the outside of each of the 7-ft. risers, fitting snugly between the upper and lower horizontal boards. This reinforces the risers and brings all the outside woodwork flush.


Incline
Platform
Incline to door platform
H
G
B
A
Dry Mash Hopper
Pail for water
Faucet
Pail for milk
33"
Dust Bath
Shell Hopper removable for filling.
2 x 2 1/2"
Egg Carrier
Opening
Partition
Trap Nests
Wall Hopper for grit or shell
Front feeding trough.
F
J
1" Water Main used for perch
Check and Wast for water main
2'
30'
36'
20'
6'
3'-6" x 6'-0"
PLAN OF LAYING HOUSE

We use a 2x6 or 2x7 mesh lawn fence over the front opening. The hens stand on the water main which we use for the inside running rail, and eat the wet mash out of the front trough thru the 2x7 openings in the wire. The openings in this fence are too narrow for even the very young pullets to squeeze thru, as they do when the 3x4 mesh "union lock" wire is used; besides, this wire is practically chicken-thief proof. The iron pipe footrail always has water in it and is never too cold for their feet, and it keeps clean.

Roof. The front rafters are 2"x6"x12' and the rear 2"x6"x14' with a 3-foot eave in front and a 1-foot eave in the rear. 2x4 rafters will not stand the strain of the roof of a building 20 feet wide, even when supported by long collar beams, as the writer has learned to his sorrow, having had to repair and straighten up a roof which sagged with the weight of a winter snow. This 3-foot eave in front gives a sightly appearance to the coop and affords the necessary protection to the opening with its curtain and the feed trough which is required by the peculiarly rainy climate which it is our privilege to work in at least six months (?) of every year on this coast. We use a 24-in. eave over the gable ends, with a 2x6 floating rafter. This protects the ends and especially the doors, so that they don't swell up and refuse to latch. The comb of the roof is 10 feet from the floor. Use 8-in. or 10-in. shiplap for the sheathing boards, carefully tacking pieces of tin over every loose knot if paper roofing is used. Shingles make the most durable roof but require an enormous amount of labor and time to lay and are not as warm as the prepared roofing. The cost exclusive of labor is about the same. Shingles should not be laid on solid sheathing as they eventually soak clear through and unless the boards have been spaced a few inches apart the air can't get in sufficiently to dry them and the boards soon rot.

Use 1x6s 6 feet long for rafter collar beams. We have discontinued the use of the long, unsightly wood collar beams or tie boards and now advocate the use of ½-in. iron tie rods 16 feet long, one every 9 feet or every third rafter. These rods have a 3-in. threaded end bent at an angle a little more obtuse than a right angle, so that when the rods are driven thru the holes bored in the rafters and the nut on each threaded end is drawn up against iron washers placed over the tie rod, the slanting pull takes up the slack and the rods carry the strain of the outward pressure of the roof. We then string a series of parallel wires (about 16-gauge) over each tie rod clear to the comb of the roof, to prevent hens roosting on the rods and soiling the litter underneath. The wires are 2½ inches apart.

To prevent any possibility of the roof sagging between tie rods, we use a 2x8 ridgeboard. This ridgeboard is carried out 2 feet over each gable end and supports the upper ends of the floating rafters or barge boards.

The Door. Make the door 3 feet 6 inches wide, of matched flooring, to facilitate the handling of litter and easy access with the poultry cart or wheelbarrow. Have it open outward. Paint both sides to prevent swelling and shrinking. Bring the bottom hinge out 2 inches from both the wall and the door, on two 2x4 blocks which are fastened securely to each. This will provide an everlasting and automatic door closer. The cheap iron "thumb latch" is preferable to a regular door latch in that it can handle several inches of swelling and contraction.

Ventilators. Controllable ventilators are absolutely essential for the comfort and health of the flock. The skylight roof ventilators illustrated on the building in this article are easily made and give the best results of any

we have ever used. Any old window sash if well leaded will answer the purpose, but the regularly constructed hotbed sash with its overlapping glass is best in the long run. This top ventilator lets out the superheated air above the front opening on hot days and is rarely closed even in winter, as we find that circulating air is far healthier for the birds, and the condensation of the breath of the fowls on the roof, floor and walls is not as great in freezing weather when the air is kept constantly moving. Much of the dust which otherwise would settle in the coop is carried out through these ventilators. In addition to the top ventilators we find that a fresh air intake at the bottom is essential when the curtain is down tight in extremely cold weather.

The Floor. If cement is used, use one and one-half inches of a 1-3-5 mixture for the base and one-half inch of a 1-1 mixture for the top. If boards, use 2x4 joists supported by four strings of 4x4 sills made of 2x4s spiked together. The two outside sills are brought up even with top of the floor joists and joists are toenailed into them. Number three 4-in. flooring gives a satisfactory chicken-coop floor. The floor should be as smooth as possible to permit the scaling off of the droppings when the litter is changed. Paint the floor with crude creosote to prevent warping. The dirt floor is of course the cheapest but least satisfactory. It is impossible to keep clean straw litter in connection with it, and much of the grain fed is either wasted or becomes too mouldy and buried in the filth which accumulates. If contagious disease once gets a foothold it is difficult to control it with the dirt floors. Most users of dirt floors remove and replace 6 to 8 inches of the top ground every year. This is far more labor than is the occasional scraping of the hard cement or board floor with a spade. The sand flea is usually very much in evidence in the dirt floor, and the dust resulting from fowls scratching in it will soon obliterate all signs of paint and cleanliness besides discoloring the curtains.

Dustbath. Reserve 30 inches for one-half the length of the front floor area of the coop for a dustbath. This bath should be on the original soil, not on the floor of the coop. It should be at least 18 inches below the top of the 16-in. litter retaining wall. We find that a reserve of 2 feet of soft sandy earth is necessary to carry the hens thru the wet weather and afford a supply to put on the droppings boards after cleaning each morning. If on top of the real ground it will stay moist and give more satisfaction to the birds and besides will not need replenishing nearly so often. If too near the top of the litter board the birds will hop out with several pounds of dirt on their feathers and immediately shake it off on the nice clean litter. This dust bath is placed where the sun strikes it and makes the ideal location for all the water and milk receptacles, which are set in racks directly over it.

The furnishing of this coop will have to be described in a later article. The construction of the droppings boards, roosts, trapnests, hoppers, kale racks, broody coops, trolley egg collector and trapnest chart holder, droppings carrier and the improved roller curtain, besides our improved automatic oat sprouter, will be taken up as space permits.

We have used a 30-ft. unit in our drawings because this length utilizes two roosting-closet sections of 15 feet each and three front-opening sections of 10 feet each. This building can be extended each year, and the only limit to the eventual length is the strength of the tackle for hoisting the curtain, which limit is about 200 feet.

We find that 500 birds is about the maximum feeding unit. When 1,000 are fed in one room without wire partitions they all crowd to the end when the feeding starts and clean up the feed in that end in short order, while the other end will show an accumulation of feed night after night. Certain birds become accustomed to one end of the building and do not explore the other. As a consequence, they rarely get enough to eat when the 500 which occupy the far end are permitted to range the whole coop at feeding time. A good practice is to close the wire partition doors before feeding and hold the birds in practically even units.

NOTE.—This Station is prepared to supply a complete set of blueprints taken from large scale drawings showing the construction in detail of this building, including trapnests. Building material bill is included. The price per set is $1.00.

APPLE AND PEAR SCAB.

Arthur Frank, Plant Pathologist.

In Western Washington the control of apple and pear scab is one of the grower's most important problems. Every year the fungus causes much damage and results in great loss. The disease is widespread and occurs in practically all orchards.

Besides damaging the fruit for sale the scab also injures the trees. The following is a list of the injuries that the scab causes, some of which escape the attention of the grower:

Losses—

(1) Reduces the value of the crop.
(2) Causes drop of young fruit during or just after blossoming period.
(3) Infected apples which mature are of smaller size.
(4) Many scabby apples drop before picking time.
(5) Keeping quality is impaired, as many rot fungi are enabled to enter thru the scab spots, which weaken the skin.
(6) Vigor of trees is impaired by leaves being infected.
(7) Scab will develop on stored fruit.

The disease **can be controlled** by correct spraying practice. Successful spraying methods are based on a knowledge of the disease and the factors influencing it, and an understanding of the materials that may be used.

Symptoms. The disease appears as olive-green spots and areas on the leaves and the fruit. It may occur on the under and the upper surfaces of the leaves. Frequently on pears it affects the twigs, causing a blistery appearance of the bark. If fruit both of the apple and the pear is infected early it causes malformed fruits, and if the disease is abundant it causes cracked and gnarled fruits. The disease also attacks the blossoms and the blossom stems and if abundant will cause a drop of young fruit from killing the stems.

Cause. The cause of the scab is the fungus **Venturia inaequalis.** The fungus lives during the summer on the leaves and the fruit. The olive-green spots are masses of mycelium and spores, or seeds. These are blown about in the air and thus spread the infection onto other leaves and fruit. Sometimes apple fruit apparently free from scab will be already infected when picked and the spots will develop later in storage.