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POULTRY HOUSES AND FIXTURES

THE
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QUINCY, ILL.

WELL-PLANNED HOUSES ON POULTRY PLANT AT U. S. GOVERNMENT EXPERIMENT FARM

The planning and location of houses are subjects worthy of the poultry keeper's most careful attention. Many practical, helpful suggestions will be found in the above views on the poultry plant of the U. S. Department of Agriculture at Beltsville, Md. 1—Colony house for growing stock on range. 2—Cockerel house. 3—Portable colony hover house. 4—Colony house for growing stock in woodland. 5—Gable-roof breeding house. 6—Portable house for adult stock (threeeders or layers) on range. 7—Compartment house for layers or breeders. Feed house at right.

POULTRY HOUSES AND FIXTURES

How to Lay Out Poultry Plants. Accurate Plans for Constructing Practical,
Economical Laying Houses, Large and Small. Low-cost Construction
for Back Yard Poultry Keepers. Colony and Portable Houses,
Incubator and Brooder Houses, Administration and Other
Special Purpose Buildings. Labor-Saving Interior
and Exterior Fixtures and Equipment

FULLY ILLUSTRATED

EIGHTH EDITION

PRICE, \$1.00

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INTRODUCTION

POULTRY houses correctly planned and built are vitally important to the success of every poultry enterprise, whether it is to be established on a large or a small scale. While such houses must of necessity be comparatively plain and simple in design, they also must meet certain definite conditions to be genuinely practical. Regardless of size, every such building, for whatever purpose intended, must provide not only for the comfort and well-being of the fowls, but also for the convenience of the caretaker. And it must do this always at moderate cost.

To be able to design a house that will meet these truly important requirements, calls for much practical experience, for a wide knowledge of what others have tried and found satisfactory—or unsatisfactory—along the same lines, and finally, for some knowledge of the general principles of architecture. It is small wonder if beginners and even experienced poultry keepers, make innumerable mistakes in their building operations—mistakes that must be corrected at heavy expense or remain as permanent handicaps to their future success.

Under such conditions there is an unquestioned need for a book that shall present, in a fairly comprehensive manner, the best that is available in practical up-to-date plans conservatively designed to meet the requirements of poultry keepers wherever located. It was to supply this need that "Poultry Houses and Fixtures" was published, the first edition of which was issued in 1897, and which has been revised from time to time to keep pace with the rapid developments that have taken place in this branch of poultry science since that date. In point of fact, this development has been so rapid and so radical that in this latest revision it has been found necessary to employ new plans and new descriptive matter almost exclusively throughout all sections of the book.

As the completed work now stands we believe that it meets the requirements of practical poultry keepers to a degree unequalled by any similar publication. It contains complete and thoroughly tested plans for each type of house that is likely to be required for the use of fowls, fixtures and general equipment have received special attention and we have taken advantage of the opportunity afforded by this revision, to supply a chapter presenting clearly and in much detail, the general principles of poultry-house design and construction, so that the individual builder, even though he may have had little or no personal experience, will be able to weigh with reasonable accuracy the respective merits of the different plans, as they relate to his particular requirements, and also intelligently to make such modifications as his individual conditions may render desirable.

The changes in approved types of poultry houses that have taken place in recent years have been particularly marked in the case of those provided for laying and breeding flocks. When "Poultry Houses and Fixtures" was first published, warmth in winter was regarded as of the first importance in such houses, and all details of construction were designed primarily to "provide summer conditions in winter," without which profitable egg production was regarded as out of the question. These houses were liberally supplied with glass and often were provided with sloping fronts, skylights, and double walls carefully packed with insulating material. All of these added greatly to the cost and, as we now know, are entirely unnecessary and may even prove injurious to the fowls.

Experience has shown that closed-front houses are almost invariably poorly ventilated, damp, and unsanitary in winter, and that fowls in them are especially liable to colds, roup, and other diseases directly traceable to such conditions. For this reason, and also on account of the extra cost of building such houses, their popularity soon waned and in some sections, notably New England, scratching-shed houses of the type illustrated on page 34 came into vogue for a time. The scratching-shed house gave the fowls much better conditions in the daytime but, with mistaken kindness, still provided a "warm" place for them at night, the place being, as a rule, a dark, inadequately ventilated "dungeon" so obviously objectionable from a sanitary viewpoint that the popularity of the scratching-shed house was never more than local. It served chiefly as a stepping stone in the change from the old-fashioned warm house to the present curtain-front or open-front type which undoubtedly meets the requirements of adult fowls more nearly than any other now known.

The practice of using houses with open fronts or curtain fronts has become almost universal in the last few years, and it is only under peculiar conditions that closed-front houses are now regarded as practical. While the terms "open front" and "curtain front," as applied to poultry houses, are used rather indiscriminately, the former, strictly speaking, refers to a front the greater part of which is left open at all times. The "curtain front" also has large openings, but these are provided with curtains or cloth-covered shutters which can be closed in extreme weather. The "closed-front" house has all openings covered with glass sash. It is common knowledge now that fowls will lay well in cold houses so long as they are free from drafts and dampness, and nothing has done so much to reduce losses from disease and to make poultry keeping a practical, money-making industry, as the general adoption of fresh-air houses.

No one person can claim the credit for the development of this method of poultry-house construction. It has been the gradual result of the experience and observation of practical poultrymen in widely separated locations, who have found that still cold is not a serious obstacle to winter egg production, and that the proper use of muslin curtains or muslin-covered shutters insures the best kind of ventilation, at the same time keeping the house as warm as it is possible to have it and secure the free circulation that now is generally regarded as absolutely essential to the health of the fowls. The famous Maine Station cloth-front poultry house, illustrated on page 35 was one of the first houses of this type to be built, and it has served as a model for thousands of others.

Acting apparently on the belief that if a little fresh air is good, a great deal is better, some extreme types of open-front houses have been developed. These houses serve practically no purpose except to protect the hens from direct storms, the inside temperature being little if any higher than outdoors. These extremely cold houses appear to have been developed through a failure to realize that if fowls lay well in them they do so, not because the houses are cold, but in spite of that fact. In other words, there is no advantage in exposing the hens unnecessarily to extreme cold. On the contrary, it is a distinct advantage to keep the house as warm as is possible without interfering with proper ventilation. Sooner or later poultrymen who adopt radical open-front con-

struction are glad, as a rule, to provide muslin protection and to utilize it fully on occasion.

The foregoing applies, of course, only to winter conditions in cold climates. For warm weather it scarcely is possible to provide too much ventilation. This is, in fact, one of the builder's most difficult problems—to secure sufficient ventilation in warm weather without making the house too cold for successful winter use—and in the north it calls for careful proportioning of window and muslin-covered surfaces to the total floor space enclosed.

The building plans given in this book are conservatively designed with reference to the amount of glass and muslin-covered openings provided. These houses, as illustrated, are intended to meet the requirements of poultrymen in moderately cold climates. The only change that is necessary to adapt them to extremes, either of cold or heat, is to increase or decrease the size of the curtains. Glass windows are not required south of the Ohio River. Some poultry keepers far north of that latitude omit glass sashes, but as a rule it is doubtful whether it is true economy to do so. In all northern latitudes there are many cold, stormy days in winter when the curtains must be down, and the houses will be inadequately lighted at such times unless some glass is provided.

Muslin-front construction is applicable to laying and breeding houses, colony houses, portable houses, and brooding coops. For permanent brooder houses, which are used mainly in severe winter weather, conditioning houses, incubator cellars, etc., other and more suitable methods of ventilation are provided.

The widespread popularity of the muslin-front house has resulted in a virtual standardization of poultry-house construction—one of the most encouraging developments in the industry. Uniformity and simplicity in house design mean economy in construction and greater certainty of results than can possibly be achieved where there are no established standards to adhere to, and where each builder feels the need of originating a special type of house to meet his particular requirements.

There still is, and probably always will be, a tendency among beginners to try to work out original plans in poultry-house construction, but it is one that, in the interests of economy and efficiency, should be firmly repressed. The beginner can safely assume that the essentials of poultry-house construction are now so thoroughly understood that approved general plans now require only slight modifications to adapt them to special requirements of location or climate, in practically all parts of the country; also, that the advantages of adopting standard designs are so great that scarcely any practical condition will justify radical departures from them.

Many new plans have been prepared expressly for "Poultry Houses and Fixtures," embodying, in each instance, only those designs and details that have been developed and tested in practical, every day experience. We have attempted to present sufficient variety to meet the requirements of poultry keepers in all parts of the coun-

try. Throughout the book, however, it will be seen that, so far as laying and breeding houses are concerned, we have kept close to certain clearly defined standards, so that there need be no confusion in the mind of the reader as to just what changes, if any, need be made in a given plan to adapt it completely to his own conditions, whatever they may be. As a rule, complete bills of materials required in building the different houses are supplied, but no estimates of construction cost are given, or only in the most general way. Prices of all kinds of materials vary so widely at the present time that estimates of cost would serve no practical purpose.

At the risk of seeming repetition we desire to impress upon the prospective builder that, in poultry-house construction particularly, experiments are costly. Doubtless there are possibilities for improvement in the best plans, but the brightest and most experienced poultrymen and women in the country have been studying the building problem for many years. In connection with the plans here given there is scarcely a modification or change that is likely to suggest itself to the beginner that has not been tried out many times and under many conditions, and rejected for good and sufficient reasons. It is commendable to be on the lookout for better plans—for advanced ideas, but the practical conservatism that allows "the other fellow" to try out new things first, saves much disappointment and expense.

The beginner, therefore, who carefully considers his needs and requirements, and then selects the house that most nearly meets his conditions and follows the plans literally from foundation to roof, will save time and money and he will be certain of having a building that will not disappoint him when put to practical test.

In the designing and testing of poultry houses the various state agricultural experiment stations have taken a leading part in recent years. Much of the present standardization in poultry-house construction, to which reference has already been made, must be credited to this source. In "Poultry Houses and Fixtures" we have availed ourselves freely of the plans given in the various state and national government bulletins on the subject.

In presenting plans and detailed descriptions from this source, personal credit has been given wherever possible, but we wish here to express our especial indebtedness for helpful suggestions and down-to-the-minute information secured through direct correspondence with many of these government workers, each a recognized leader in the poultry industry, and each with special fitness for giving instruction in poultry-house design by reason of elaborate and long-continued experiments in this particular line.

This edition of "Poultry Houses and Fixtures" has been carefully edited by Homer W. Jackson, Associate Editor of Reliable Poultry Journal, who has prepared many of the plans, and has furnished all of the text not duly credited to other contributors.

Locating and Planning Poultry Houses

Laying Out the Poultry Plant to Save Time and Labor—How to Design Poultry Houses and Adapt Plans to Meet Special Conditions—Practical Building Suggestions That Insure Comfort and Health of Fowls at Reasonable Cost—Details of Carpenter Work Made Easy for Amateur Builders

FOWLS are highly adaptable with respect to the conditions under which they may successfully be kept. This is extremely fortunate, because the poultry keeper's choice of location often is necessarily determined by personal rather than by practical considerations. There are some conditions as to climate, soil, market, etc., that are conceded to be ideal for poultry keeping, but it by no means follows that success is out of the question where these are lacking. On the contrary, the great majority of successful poultry keepers have made good in the face of obvious handicaps. Success, therefore, is not so much a matter of location as it is of intelligently adapting methods to the particular conditions that are to be met.

Consideration of the numerous general problems of poultry farm location does not come within the scope of this work. It is assumed that this important subject has received due attention here, and that the reader already has his farm or plot of ground, of whatever size, and wishes now to learn how he can utilize it to best advantage in the development of his poultry flock, locating and planning the buildings with a view to securing every practical convenience, at the same time avoiding unnecessary expense. He will also want to learn how to avoid making mistakes that may prove to be serious handicaps in years to come.

It may be well, however, to say that, where choice is possible, the poultry plant should have sandy or gravelly soil, for the sake of drainage. The ideal soil for the poultry plant is sandy loam—sandy enough to be well drained, but fertile enough to hold a sod and produce quick-growing crops under cultivation.

It is entirely practicable to keep fowls successfully on clay soils, but intensive methods are not to be recommended under these conditions. Such soils are much more apt to become infected with disease germs and they require quite different treatment from the free and easy methods that are permissible on sandy soils.

Regardless of where the houses are located, good drainage is essential. There is no possible excuse for building where surface water can obtain access to the floor, or for locating the house in a place where standing water is present. If the desired location is low, it should be filled in and raised at least a foot above its surroundings. In damp locations a board floor three or more feet above the ground is especially desirable, but do not make this elevated floor an excuse for building over a low, wet spot. Such a location is positively unhealthy and will certainly result in disease and heavy losses.

In the north every natural feature that will serve the purpose of a windbreak should be utilized to the fullest possible extent. A poultry plant or an individual house

sheltered from prevailing cold winds by an elevation or a strip of woodland, as shown in Fig. 1, gives the fowls a distinct advantage over others not so protected. Lacking such natural advantages planting windbreaks of evergreens should be one of the first steps taken toward developing a new poultry plant, particularly in locations that are exposed to high winds.

As a rule, a southern or southeastern slope is desirable. This permits the houses to face the sun without being exposed to prevailing winds which, in most sections

FIG. 1.—WELL LOCATED POULTRY HOUSE, WITH OUTDOOR FEED HOPPER AND WATER BARREL

It pays to provide neat, attractive poultry houses, located where the fowls will have plenty of shade and where they will be protected from storms. Convenient equipment for supplying feed and water, as shown above, greatly reduces the labor of caring for the fowls. Photo from Purdue University.

of this country, are from the west or southwest. A southern exposure is not to be regarded as imperative, however, under any and all conditions. Where the prevailing winds are from some other quarter, and in warm climates where summer heat is more to be guarded against than winter cold, it will be much more satisfactory to face the house in some other direction. Even in the north, an eastern exposure is by no means undesirable, though in this case all openings, yard doors as well as windows, must be suitably protected against the heavy storms that occasionally come from that quarter.

All such considerations as these should, of course, receive attention in the original selection of the land on which the poultry plant is to be located. The position of the buildings themselves is, for the most part, determined by considerations of convenience and of economy in labor and time.

Intensive or Extensive Methods

The amount of land required for developing a profitable poultry plant depends upon whether the plant is to be operated on the intensive or the extensive plan; that is, whether the fowls are to be confined to comparatively close quarters or are to have practically free range. One to two thousand hens may be kept on one acre of ground, but the labor of caring for them is much greater than where more room is provided, and the danger from

FIG. 2.—PRACTICAL GROUND PLAN FOR A LARGE COMMERCIAL POULTRY PLANT

In the proportions here indicated this plan calls for about 10 acres, but it can readily be expanded or reduced to meet individual requirements, without any material change in arrangement of departments. This sketch is drawn to scale, except the range, which is reduced at broken lines to keep within page limits. Chick nursery and home garden are to be alternated to keep the soil free from disease germs. Yards and pens are planned for 100-hen flocks but if Leghorns are kept the flocks probably will be much larger and most of the division fences omitted. The orchard on the right side affords ideal quarters for breeding fowls and brooder chicks confined to temporary yards when necessary. When the chicks are able to look out for themselves they are to be transferred to the larger range in the rear.

disease is much greater. Wherever it is possible, land enough should be provided so that the fowls will not have to be crowded, and so that other crops can be grown on the land at the same time. It is much more practical, more profitable, and far safer to provide ample acreage, utilizing the valuable fertilizer produced by the fowls in the growing of profitable crops of some sort. Intensive poultry keeping involves the supplying of green food by hand practically the year round; it also necessitates sweeping and cleaning the yards, constant and lavish use of disinfectants, and after all this is done, there still is great danger of soil contamination and the spread of various forms of disease.

Such factors as the price of land, the extra labor cost of widely scattered flocks and other practical considerations, must all receive due attention in this connection, and the question of method can, in the last analysis, be answered only by each individual for himself. It will be helpful, however, to know that the general tendency among practical poultry keepers is toward a combination of intensive and extensive methods as suggested in the layout on page 8, or the one on page 11. In other words, the laying flock is kept in comparatively restricted quarters, while the breeders and the growing stock are given all the room possible. Estimating land requirements on this basis, 10 acres is little enough for 1,000 hens, and 15 acres is decidedly better. The estimate of 10 acres is on the assumption that the soil is sandy and well drained. With heavier soil the acreage certainly should be increased.

Planning To Save Labor

No poultry plant can lay claim to being wisely planned, in which the labor problem has not received most careful study, and the cause of failure, in a great many instances, can be traced directly to unfortunate oversights along this line. In planning the layout and locating the buildings, therefore, the first consideration should be to secure every possible advantage to the attendant, in order to reduce the amount of travel involved in the daily care of the fowls, and to utilize natural resources, such as range, shade, water courses, etc., to the fullest possible extent. As local conditions enter largely into these matters, no hard and fast rules can be laid down, but the principal features of the ideal poultry plans illustrated on page 8 will be found adaptable to a great variety of locations. It is, therefore, worthy of close study.

While this layout is designed to meet the requirements of a "1,000-hen farm," it can, without material change, be expanded to meet the demands of a much larger plant, or reduced to the modest proportions of a poultry department to be operated as a side line on a farm or elsewhere.

As here illustrated, it has a frontage of about 500 feet and should have a depth of about 850 feet, the rear portion being reduced for lack of space. These dimensions give approximately 10 acres and provide for a laying flock of 900 hens, also for the necessary breeding stock, which should always be housed separately from the laying flock and given much more range than it usually is practicable to provide for the latter. Nursery space is provided for the brooder chicks, range for growing stock, and abundant ground for supplying the house table with fruits and vegetables. The west side of the plot, from the driveway back at least as far as the north end of the yards, should have a row of quick-growing evergreen trees to act as a windbreak.

This plan of locating buildings, yards, etc., offers many important advantages, such as easy access to the different buildings, limited fencing, few gates to open, and a comparatively limited amount of traveling in the daily care of the birds.

In this layout, as in every practical plant, the poultryman's residence is taken as the center, the different departments of the work being located and planned with reference to distance from the residence and convenience of access therefrom.

A tolerably liberal allowance for lawn has been made, because a well-kept lawn adds much to the attractiveness of the home and to enjoyment of it. Moreover, the lawn need not be waste land, but can be utilized for the young chicks throughout the brooding season. Neat outdoor brooders, hen coops, or even colony houses around the edge of the lawn, detract little from its beauty, and a smooth, evenly mowed grass plot provides ideal range for chicks during the first few weeks of their lives.

With light, sandy soil it is practicable to raise chicks, year after year, on the same plot of ground, without danger from gapes or other chick diseases. In most instances, however, the poultryman will find that much better results can be secured if his chicks are not brooded more than two years in succession on the same ground. In this diagram, therefore, two plots of equal size have been set aside, one of which is to be used as a chick nursery and the other as a kitchen garden, alternating them every two or three years, or as conditions require. A sod or permanent growing crop of some sort is desirable on the plot used by the chicks, and with a little attention this may readily be secured, seeding the ground with a quick-growing lawn grass mixture, or with scarlet clover, alfalfa, oats, rye, rape, etc., as season and climate may dictate.

At the rear of the lawn is located the barn, which should be of good size, as it is intended to furnish room for storage of feed, litter, etc. Being within easy access of all the houses, little labor is required in distributing supplies from here as needed. Except on large plants, the plan of using a centrally located barn for general feed storage will be found more satisfactory and more economical than building a separate feed house, it being understood that each poultry house is to be provided with suitable bins, boxes or metal containers for storing small quantities of grain for immediate use.

If dressed market fowls are to form an important branch of production, a suitable room for dressing and packing them should be provided in the basement of the barn, where the incubator cellar also can conveniently be located, if provision is not made for the incubators in the house cellar or in a separate house such as the one illustrated and described in Chapter VIII.

On the east side of the rear lawn may be located a permanent brooder house. Even where most of the chicks are to be raised in outdoor brooders or colony houses, a small permanent brooder house will be found convenient. Early hatched chicks can be brooded more conveniently and with less expense in a permanent house than in scattered colony houses. When the house is not needed for chicks, it may be utilized for many other purposes, being especially convenient for fattening surplus market birds, conditioning show specimens, or for any of the various other purposes for which temporary accommodations are required at more or less frequent intervals the year around.

Next to the brooder house is located the home fruit garden, which, in the dimensions indicated, will furnish room for such small fruits as strawberries, raspberries,

blackberries, grapes, etc., in sufficient quantities for the use of the average family.

Location of Houses for Adult Fowls

On the west side of the barn and a little back of it, reached by a continuation of the driveway which leads in from the street or highway, is located the main laying house. This house consists of nine pens, each 20x20 feet, with a capacity of about 100 hens, or 125, if Leghorns are kept. In the latter case, alternate partitions in house and yard may be omitted and the size of the flocks correspondingly increased and some expense saved. Double yards are indicated for each laying pen. These yards are to be used alternately by the flocks, the vacant ones being planted to some quick-growing crop to provide green food. By shifting the hens back and forth, the growing crop (whatever it may be) will have an opportunity to renew itself, and an abundant supply of green food is insured during the greater part of the year, at practically no cost.

Fruit trees should, of course, be planted in these yards, if there is no other shade, planting in triangles instead of squares, making the rows forty feet apart east and west, and thirty feet north and south. If desired, these rows can be double-planted with peach or other quick-growing trees. The amount of yard room may appear rather limited, but with double yards less room is required than would be needed where single yards are provided. On the subject of yard room for laying flocks, see Chapter XI.

The plot north of the barn and east of the laying house can be utilized to best advantage for colonized breeding pens, or as range for the growing chicks after they no longer require artificial heat. This plot also should be planted to fruit trees.

Back of the laying yards and the breeding range, the land will be used for any crops that may be desirable, keeping in mind that this land is to serve as a range for growing stock, especially the pullets that are to be next season's layers and which, at this stage of their growth, need all the liberty that can be given them.

In the corner of the lawn between the barn and the brooder house is located the hospital building. It is quite the fashion these times to advocate the indiscriminate use of the hatchet for sick fowls, but the poultryman who is anxious to conduct his business along really practical lines, will find that he can save a large sum each

year by the timely use of suitable remedies, for administering which a separate hospital building is needed. With a little prompt attention, fowls having various simple disorders or suffering from accidents, can quickly be restored to health, and with slight trouble. Of course, no practical poultryman will return to his breeding flock any birds that have been sick, nor will he keep any that have contagious disease in any form. But fowls that have suffered from simple attacks of indigestion or some other similar ailment, can at least be held until in suitable condition to be sent to market. It is safe to say that, on the average, three out of four sick fowls that are allowed to die or are dispatched by the hatchet, could be restored to health if they received proper treatment in time.

A Layout for a One-Man Poultry Farm

In Fig. 4 is shown another layout for a poultry plant. This has been prepared by the Massachusetts Agricultural College, and is intended to meet the requirements of a "one-man, ten-acre poultry farm." It is described as follows: "This plan is especially designed for a farm sloping to the south or to the southeast. A row of large evergreens to serve as a windbreak is indicated as surrounding the farm, except on the south side, and a row is placed north of the laying house to furnish shade to young stock. The orchard consists of two and a half acres and is to be cultivated. It is intended to serve regularly as a brooding plot for late-hatched chicks and also as a run for the breeders during at least a part of the year. The portion labeled 'breeding department' is to be used for this purpose early in the season. The farm crops are to be alternated, the rotation being corn and poultry one year, and hay or pasturage the next.

"Utilizing the cornfield as a run for growing stock is an excellent plan, as it furnishes shade and green food and protection, with plenty of loose soil for scratching. The plot at the rear of the farm between the hay and corn is for the production of succulent food for fall and winter use.

"The barn recommended for use on this plant is 28x36 feet, one and a half stories high, and is intended to accommodate one horse, one cow, a shop, a feed room and room for killing, picking, and packing market fowls, and suitable tools and machinery. This plant is designed to accommodate 550 layers, four or five breeding pens, and to raise eight hundred to one thousand chicks.

"Five hundred and fifty laying hens may appear to be

FIG. 3—A GROWING ORCHARD AFFORDS FINE SUMMER RANGE FOR FOWLS
Photo from Missouri State Poultry Experiment Station.

a rather small flock for one man to care for, but taken in connection with the growing of the young stock and the production of the various crops that can be produced on this land, will keep one man decidedly busy practically the year around and, with proper management, will provide a safe, comfortable living."

Details of Poultry House Design and Construction

The general rule applied to the construction of live-stock buildings calls for one cubic foot of air space for each pound of live weight to be housed. This means that, for a six-pound fowl, only six cubic feet of air space are required, which would be provided in a house 18 inches high, allowing four square feet of floor space to each fowl. This way of stating air requirements is a little misleading, however, as fowls need much more air than other classes of live stock, in proportion to their weight. Prof. King, in "Physics of Agriculture," gives the following table, showing the average number of cubic feet of air breathed per hour by common farm animals:

Cow	2804 cu. ft. for each 1,000 lbs.
Horse	3401 cu. ft. for each 1,000 lbs.
Swine	7353 cu. ft. for each 1,000 lbs.
Sheep	7259 cu. ft. for each 1,000 lbs.
Hen	8278 cu. ft. for each 1,000 lbs.

The greater amount of air necessary to meet the fowls' requirements must be secured either by providing for more rapid exchange of air in the house, or by increasing its cubic contents considerably beyond the dimensions called for in the general rule. In ordinary poultry buildings, however, all air requirements are not only met but generally are much exceeded, as will readily be seen by estimating the number of cubic feet in the average laying house with its 7 to 9-foot ceiling. This excess volume of air is of no real advantage to the fowls, and in cold weather is a handicap to them. For this reason many attempts have been made to utilize extremely low houses, and repeated proof has been secured that, so far as the fowls themselves are concerned, they can be kept quite successfully in buildings no more than two feet high.

In practical use, however, the poultry house has a double function to perform. It must not only give suitable protection to the fowls, but it is just as important that it provide for the convenience of the attendant and afford necessary facilities for economizing his time and labor. A clear appreciation of this fact will prevent many costly experiments and errors in design, and it ought also to aid in preventing the too-common tendency to economize in cost of construction by the omission of details that are required to make the labor of the attendant really efficient.

The fact that height of roof is solely for the convenience of the attendant does not make it an unimportant matter, but there are obvious reasons why the house should be built as low as practicable. A low house will

be warmed to some extent by the bodily heat of the fowls, thus rendering it more comfortable in cold weather, while a high ceiling or roof wastes heat, causes drafts, and is more expensive to construct. In extremely warm climates high ceilings may be desirable as a means of making the building cooler, but the same result can be secured in other ways and at less expense.

Cost of Building

Under average conditions the cost of building laying houses should not exceed \$1.50 to \$2.00 per hen, yards and labor included. With careful management and the use of low-cost materials, the cost may be kept within

FIG. 4—PLAN FOR LAYING OUT A ONE-MAN, TEN-ACRE POULTRY FARM
Designed by Poultry Department, Mass. Agr. College.

\$1.00. Elaborate houses carry with them no advantage, aside from appearance. Instead, they usually develop disadvantages which do not exist in simple, plain construction.

In some of the plans in this book the reader will find alternative methods of construction indicated or suggested. What may be called the regular method aims at providing a substantial, durable building at moderate expense. The "low-cost" alternatives suggested show how the same houses can be built at the lowest practicable first cost where the strictest economy is demanded.

It is true that fowls may not be any more comfortable in a house with concrete foundation and floor and with No. 1 tongue-and-groove siding neatly painted, than in one with a dirt floor, with common sheathing boards covered with a good grade of roofing paper. Without doubt, however, the latter style of construction will prove much more expensive than the former in a period of ten years, because of the greater amount of labor in-

volved in cleaning and renewing the dirt floor, and in the increased cost of repairs in the building itself.

The man who is limited in capital is far too liable to make the common mistake of building "makeshift" structures. There are many conditions under which low cost of construction is practical and genuinely economical, but let all cost reductions be carefully considered to make sure that they are genuine economies and not the pound foolishness of penny wisdom.

FIG. 5—CORRECT WAY TO DRAIN HOUSE SITE ON SLOPING GROUND

What Materials to Use

The kind of materials to be used will be decided entirely by relative cost, in most cases. Almost any kind of sound lumber can be used to good advantage in the poultry house, though it is well to keep in mind that the labor cost of working soft woods is much less than where hard woods are employed. It does not pay to purchase inferior material where inferiority affects durability, or where it involves serious waste. As a rule, however, cheaper grades of lumber can be used than would be advisable in larger buildings, especially where a substantial concrete foundation is provided and where the sides are covered with prepared roofing.

Second-hand material sometimes can be purchased to good advantage, and many poultrymen are able to provide accommodations for their fowls at comparatively little expense by utilizing lumber from wrecked buildings, railroad cars, etc. Old railroad ties frequently can be used as sills, and in many similar ways the careful buyer can materially reduce his lumber bill. In making such purchases, however, keep in mind the fact that it costs a good deal more to build houses with second-hand lumber than with new lumber that can be purchased to exact size. The expense of getting the lumber separated and sorted, removing nails, sawing to size, and the resultant waste, all should carefully be estimated before buying such material.

How to Order Lumber

In planning poultry houses, special attention should be given to the dimensions of lumber as obtainable in ordinary lumber yards. It would be unwise, for example, to plan a house 15x25 feet, under ordinary conditions, as lumber comes in even lengths and there would be considerable waste in cutting timbers to fit these dimensions. A house 16x24 feet will accommodate the same number of hens, and can be built with practically no waste in cutting the framing timbers and boards. Where the dimensions are in odd feet but in short lengths, it is possible to avoid loss by ordering double lengths. For example, in the case of a shed-roof building seven feet high in the front, five feet in the rear, and ten feet wide, fourteen-foot studding should be ordered for the front wall, ten-foot studding for the rear wall, and fourteen-

foot pieces for the ends, each piece making two studs. The rafters will have to be twelve feet long, though eleven would answer. In this case it would not pay to order double lengths of twenty-two feet, as the price of timbers per foot, board measure, generally advances with lengths exceeding sixteen feet, and this advance would exceed the saving in waste.

In the preparation of bills of materials for the plans shown in this book, the particular grade of lumber to be used is not specified, as much will depend on local markets and the preferences of the builder. For permanent buildings the grade known as No. 1 common will usually be specified for rafters, sills and joists, and No. 2 for studs and plates. For trim lumber and siding No. 1 common will do, unless it is to be covered with roofing paper or shingles, in which case No. 2 common may be used. For sub-floors and roof sheathing No. 2 common will answer. Sheathing boards for the roof should be surfaced on two sides; trim lumber should be No. 1 common and surfaced on four sides.

Where the surfacing must be done to order, and at extra cost, it may not be practical to insist on this in all cases, but as it often is desirable to reverse boards in order to cut them to good advantage and to hide minor defects, it is desirable to have exposed boards surfaced on all sides if possible. Inside walls can be painted or whitewashed at less expense if smooth, and prepared roofing will last longer when laid on a smooth surface.

Dimensions of the Laying House

In planning the laying house, about four square feet of floor space is required for a hen, where flocks of one hundred or thereabouts are provided for. In mild climates where the hens do not have to be confined to the house for long periods, an allowance of three feet per fowl will prove sufficient. If the flock is quite small, five square feet should be provided, and in the case of breeding stock, six to eight feet per fowl is recommended.

The height of the front must be proportioned to the depth in order to get sufficient pitch to shed rain, also to admit sunlight to the back part. The latter, however, is not regarded so essential as it was a few years ago, and many practical poultrymen now are building houses 16 to 24 feet wide with what is known as a combination roof (see Fig. 23), in which the front is seldom more than about seven feet high. Obviously, this will not admit sunlight to the back part of the house, even though the openings are carried clear up to the rafters. As an offset to this the practice of installing small windows in the rear wall under the droppings platform is becoming popular (see Fig. 37). Such windows, while they do not admit direct sunlight, make the back part of the house light and more attractive to the fowls.

FIG. 6—SQUARING A CORNER

The extent to which the sun's rays will be admitted to the poultry house in different seasons of the year, with

windows placed 4, 6 and 7 feet high, respectively, is clearly shown in Fig. 7, on this page. In the wintertime, with the window 4 feet high, direct sunlight will never reach farther back than 9 feet from the front (see dotted line). With the window 6 feet high it will penetrate to 13½ feet (see line of dashes), and at 7 feet it will reach the rear of a 16-foot house (see solid line). In the summertime when the sun is higher in the sky, the penetration will be much less, as shown by the second series of lines.

It should be understood that in each case these lines represent extreme penetration, which lasts for but a short time, and occurs only when the sun is rising or setting and when the rays have comparatively little power. Provision for securing direct sunlight on all parts of the pen floor, therefore, is practical only to a limited extent, and the advantage of doing so probably is very slight. It is much more practical to be sure that the window and shutter openings are placed so as to light and ventilate the house properly and conveniently, without exposing the fowls to drafts, and without being too greatly exercised over the theoretical advantages of "flooding the house with sunshine."

The height of the house, as has already been suggested, is determined chiefly by the requirements of the attendant. The rear or north wall seldom need be more than five feet high, and where prepared roofing is used, the front need not be over seven or seven and a half feet, up to a width of twelve feet. If fourteen to sixteen feet wide, the front should be eight feet high, where a shed roof is provided, and about nine feet with a twenty-foot house. For a width of sixteen feet or over, a combination roof generally is recommended, usually with a seven-foot front and a ridge about nine feet high.

In order to insure a dry floor it should be six inches to one foot above the ground level, whether it is of earth or concrete. If a board floor, it should be elevated at least one foot above the ground level, and in damp locations, three feet or more. When the house is built on sloping ground, the site should be leveled, with a ditch on high side, to drain the water off after rains (see Fig. 5.)

Squaring the Foundation

In squaring the foundation the method shown in Fig. 6 will be found convenient and practical. In using this method three stakes (a, a, a) are driven at each corner, about one foot outside of where the permanent wall is to be located, and about three feet apart, connecting them at the top with strips of board (b, b) about four inches wide, after which a cord should be looped around small nails (c, c), driven into the boards, as indicated in drawing. The points at which the cord crosses itself represent approximately the corners of the building.

Now, taking one corner as a trial corner, measure from the point where the cords cross (d) to a distance of six feet on one side (e) and eight feet on the other (f). With these two dimensions secured the corner will be exactly square when the distance between the points e and f, measuring diagonally, is just ten feet. If the diagonal line does not measure exactly ten feet, change the

position of the nails holding the cord until the correct measurement is secured. With one corner established in this way, it is an easy matter to square up the others in a similar manner. The corner strips should remain in position until the frame of the building is up, so that no matter how many times the cord may have to be removed for convenience in construction, it will always exactly indicate the corners when looped over the nails.

Concrete Foundations

The foundation of the poultry house should be substantial and well made. Only in the cheapest and most temporary structures is it advisable to build without a foundation, and there seldom is any economy in setting the house on wooden posts. If it is not desirable to provide a solid concrete foundation, at least place the building on concrete posts, which cost but little more than wood and are practically indestructible.

Where the soil is firm, the simplest and easiest way to build a concrete foundation is to excavate a trench about eight inches wide and deep enough to extend below the frost line, filling in to the ground level with concrete.

Where the soil is not firm, the trench should be wider to admit form boards. Wherever practicable the trench

should slope to the lowest point, from which a line of tile may be laid to provide outlet for any water that may accumulate within or under the foundation walls. In damp locations it is a good plan to lay a line of two-inch tile underneath the foundation, all around the building, or to put a

few inches of coarse broken stone in the bottom of the ditch, starting the concrete wall on top of this.

Where field stones are available, dig the ditch a foot wide and fill it in with stone to a few inches below the ground level, on top of which an eight-inch concrete foundation is to be placed. Under ordinary conditions the foundation should extend six to twelve inches above ground level, being built by the use of form boards spaced about six inches apart. See Fig. 8. Fig. 10 shows another method of building the foundation where a wide footing is desired.

Where stone is easily secured, foundations of this material may be used at less cost than concrete. Stone walls should be about twelve inches wide, and should be carried down to the frost-line, and underdrained as described for concrete foundations.

If wooden foundations are desired, cedar, locust, catalpa, or chestnut posts will be found most desirable. These should be placed at least two to three feet in the ground, and spaced not over eight feet apart. All wooden posts should be treated with creosote to prevent decay. There are few conditions, however, under which it is desirable or economical to use wooden posts. If a solid stone or concrete wall is considered too expensive, or if the building is to have a board floor elevated off the ground so that a solid foundation wall is not necessary, it will cost little if any more to provide stone or concrete posts than wooden ones.

Where wooden foundations are used with earth floors, it is common practice to provide subsills of 2 by

FIG. 7.—DIRECT SUNLIGHT IN THE POULTRY HOUSE

6 or 2 by 8 planks. These are sunk into the ground somewhat less than their entire width with the regular sills resting upon them. The purpose of the subsill is to keep the frame sill above the ground, thus protecting it from

FIG. 8—CONSTRUCTION OF CONCRETE FOUNDATION

chief recommendation being that they are inexpensive. Where earth floors are to be used, the house should have a solid concrete foundation if possible, carrying it up ten to twelve inches above ground level, the space enclosed being filled in nearly to the sill.

In order to keep the earth floor dry and warm, there should be a layer of four or five inches of gravel or broken stone at the ground level, with earth filled in on top. Where such floors are used it is necessary to remove all soiled material at least once a year, and replace it with fresh earth brought in from outside, a laborious and expensive job. Hens confined on earth floors will soon form wallows that may reach to a depth of a foot or more, and it is extremely difficult to keep the surface of the floor smooth and even—another objection to this method of floor construction.

Clay Floors

Where stiff clay is available, an excellent and inexpensive floor can be made by filling in between the foundation walls with a few inches of broken stone, on top of which is spread a layer of two or three inches of clay. This should be wet down until it becomes pasty, and while in this condition should be thoroughly tamped, after

FIG. 9—POULTRY HOUSE WITH HARD CLAY FLOOR

which it is smoothed off and left to dry undisturbed. When dry, this layer of clay will be very hard, and if protected from moisture and not undermined by rats, will last for many years without renewal or repairs. The house shown in Fig. 9 is, provided, with a clay floor

which has been in use many years, giving complete satisfaction.

Concrete Floors

For general use no material is as desirable for poultry-house floors as concrete. It is indestructible when properly made, is rat-proof, easy to clean and sanitary, and is dry and warm when properly insulated.

There are various plans for constructing concrete floors, depending upon the nature of the materials available, but under most conditions the method shown in Fig. 11 will be found satisfactory. Concrete floors should be six to twelve inches above ground level, depending upon the nature of the soil. In sandy or gravelly locations, six inches may be high enough, but in damp locations or on heavy soils, it is better to have the surface of the floor ten or twelve inches above ground level.

Concrete floors should always be insulated to avoid dampness. As a rule, a layer of several inches of gravel or broken stone is sufficient. In especially damp locations it is advisable to spread one-ply tarred paper on top of the stone or gravel filling, with the concrete laid directly on this. Concrete floors for poultry houses should be about two and one-half inches thick, with an additional half-inch topping of sand and cement.

FIG. 10—CONCRETE FOUNDATION WITH WIDE FOOTING

Where cinders are obtainable, they can be used in place of stone or gravel, both for the insulating layer and for the concrete base. A concrete floor of cinders is not as strong as when stone is used, but is warmer. Do not use fine ashes from the kitchen stove or the house furnace for this purpose, but the coarse cinders produced at mills and factories generally.

In laying concrete floors, always provide expansion cracks by dividing the floor into suitable sections and cutting through with a trowel or other instrument. A common practice in laying floors is to divide the surface into squares, and lay alternate ones, which are allowed to set before the remaining ones are filled in. Where this is done, the expansion cracks are automatically taken care of. See Fig. 12.

Do not attempt to economize on foundations and floors by skimping in the thickness of the material or the percentage of cement, thus securing a surface that will crack and give way in use. Neither is it wise to lay a concrete floor unless a suitable concrete foundation is provided to support the outer edges and to prevent rats from burrowing underneath.

Concrete Slab Floors

A simpler method of providing a concrete floor for the poultry house is by the use of a "concrete slab." The method of constructing this is described by Prof. F. C. Elford, Poultryman for the Dominion of Canada, as follows:

"No trenches are dug for the foundations. The floor is laid upon the ground, top of the floor being from 10 to 15 inches above the surrounding level. To form a

"slab," take enough boards to reach around the outside of the building. Boards one inch thick will do, and as wide as the height of the floor above the surface. Set these boards on edge and stake them in position so that the inside of the boards is the exact size of the house.

FIG. 11—CORRECT METHOD OF LAYING CONCRETE FLOOR

Concrete floor laid over a few inches of well-tamped broken stone or gravel and a layer of tarred paper, will be dry and comparatively warm. Note method of anchoring building to foundation by means of bolts.

Level the top edges, and nail a six-inch board lightly to the top edge so that it will project in over the floor. In this six-inch strip bore holes every 6 to 10 feet to take a $\frac{5}{8}$ -inch bolt. These bolts are for the purpose of holding the sills and should extend above the finished floor far enough to go through a 2x4 scantling and leave room for a nut. When the heads of these bolts become secured in the concrete, remove the six-inch boards that hold the bolts in position so that the straight edge can be used to level the surface of the floor.

"When the frame is leveled and secured, the stone may be filled in. This could have been dumped on the ground before with less trouble except that it might interfere with the leveling of the boards. Stone, brick, plaster or anything of a like nature should be used to fill up to about two inches from the top of the floor. In filling in, there should be several inches left around the inside of the frame to allow for concrete being placed there to form the outer surface of the wall. Fill in with concrete to the inside of the frame, and to within $\frac{3}{4}$ or one inch of the finished floor surface. The finishing coat of cement is then put on, leveled with the straight edge to the top of the frame or retaining boards, and smoothed off with a trowel.*"

Board Floors

Board floors² are used by many and are satisfactory, especially where it is desired to have the floors elevated above the ground level. Board floors should always be elevated above the ground at least enough to allow the air to circulate underneath, in order to insure dryness, also to give cats and dogs access to the enclosed space which, otherwise, is certain to become a rat harbor.

It is a decided advantage, in damp locations, to have the main floor raised several feet. Where this is done, the foundation of the building usually consists of concrete or stone pillars, set about eight feet apart, and the space underneath the floor is tightly en-

closed on three sides with regular weatherboarding. As be less than three feet high, and preferably five feet, as in the house illustrated on page 52. Where the floor is less than three feet above ground, it is difficult to clean out underneath, as should always be done at regular intervals. It also is quite inconvenient when the hens make their nests under the floor, as they usually insist on doing. For these reasons, if the wooden floor is raised only a short distance from the ground, it is better to enclose the space and keep the hens out.

Board floors are liable to be cold and drafty unless carefully laid, and it usually will be found best to double-board them, as shown in Fig. 14, with a layer of water-proofed building paper between the top and the sub-floor. The latter may consist of the cheapest boards, though large knot holes and decayed spots should be cut out or filled in with sound material, or covered with pieces of sheet iron or tin. It will add to the strength of the building if this sub-floor is laid diagonally. The top floor should always consist of tongue-and-groove boards, driven up tight together and well nailed. Portable houses should always be provided with double board floors, with diagonal sub-floors which brace the building and prevent its being racked in moving.

Framing the Poultry House

There are various ways of framing the sills for poultry houses, the one shown in Fig. 13 being most generally used with board floors. In such cases the inside sill will be notched to engage corresponding notches in the ends of the joists. A simpler plan, and one that calls for less sawing and is just as good for practical purposes, is to use one 2x8 sill, spiking a 2x4 on the inside, along the lower edge. Notch the joists so that they will rest on the 2x4, with the top even with the top of the 2x8 sill.

FIG. 12—PROVIDING EXPANSION JOINTS IN CONCRETE FLOOR BY LAYING ALTERNATE SECTIONS
Photo from Mo. State Poultry Exp. Station

In houses with solid foundations and concrete floors, the sill is of comparatively little importance, and usually consists of a single 2x4, or, in some instances, two 2x4s spiked together. Houses with concrete floors should be anchored, so that they cannot be shifted by the wind.

* Extract from Bulletin 87, Canadian Dept. of Agriculture.

For this purpose, half-inch bolts should be set in the foundation wall at intervals of about ten feet. These bolts should be about one foot in length, with washers for both ends. The bolts should be embedded in the concrete, with the head down, and the threaded end extending three or five inches above the top of the foundation, depending upon whether a single or double sill is to be used. This method of anchoring the sill is indicated in

Fig. 11. The joists in board floors should always be bridged by the use of diagonal strips, as shown in Fig. 15, which stiffen the floor and add greatly to its strength.

Various methods are used in constructing the frame work. It is possible to frame a building

very cheaply, especially where upright boards are used for the walls. Fig. 19 shows a cheap but practical frame, consisting of a single 2x4 sill, single studs at each corner, with wall studs every five to ten feet to support the top plates and girders or stringers, one of which should always be provided midway between sill and rafter plate to stiffen the walls and prevent warping of the boards used for siding. Under ordinary conditions, a building constructed in this way, with the outside covered with a good grade of prepared roofing, will answer, though it is too light for a permanent building or one of large size.

Where tongue-and-groove siding is to be used, the method of framing illustrated in Fig. 16 is commonly employed, the wall studs being spaced two feet from

FIG. 13—FRAMING SILLS FOR BOARD FLOOR

FIG. 14—LAYING A DRAFT-PROOF BOARD FLOOR

center to center. Doubling studs at corners, doors, and windows, as indicated in illustration, is customary among carpenters, but rarely is necessary in poultry-house framing. The horizontal plate shown in middle of back wall is to support the rear edge of droppings platform.

The framing of a house with combination roof does not differ from a shed roof house except in the rafters.

One method of framing these is shown in Fig. 17. The plan of supporting the ridge and preventing side-thrust by means of short tie pieces should prove entirely satisfactory with houses not over 16 feet wide, but where the width is 20 feet or over, especially if the house is a long one, the ties should reach substantially from front to rear plate to give strength, or they may be entirely omitted except at partitions, and a girder-and-post support provided instead, as in cross section shown in Fig. 73, page 42.

Constructing the Walls

For cold climates, also for permanent buildings, it will be found more satisfactory, as a rule, to use tongue-and-groove siding, which makes a tight, fairly draft-proof wall, and in a term of years will cost less for upkeep. Only under extreme conditions need the walls be celled.

In all cases where a double wall is provided, special attention must be given to making the house rat-proof, as it is practically impossible to dislodge rats after they have once established themselves in such a building. If the house has a concrete foundation, and the first few inches of the walls are filled in with concrete, it will be impossible for the rats to obtain entrance.

One method of constructing the walls of a poultry

FIG. 15—BRIDGING JOISTS TO STRENGTHEN FLOOR

house is shown in Fig. 18, consisting of tongue-and-groove siding lined with paper, held in place with strips. In lining a new building the paper may be secured with less trouble simply by tacking it to the outside face of the studs before putting on the siding. This construction is practical and satisfactory where fowls do not have access to the paper. Where this is the case, no matter how carefully it is nailed on, they will soon tear it off.

In some sections the poultry-house wall consists of sheathing boards covered with waterproofed building paper, over which shingles are nailed. This is excellent construction, but rather expensive. (See Fig. 20.)

With most of the buildings illustrated in this book there is no necessity for bracing, except as indicated in special cases. However, where the house is to be exposed to severe winds, it is safer to put braces at all corners, and, in the case of long houses, to put in interior braces, locating them at partitions, so that they will not be in the way.

Different Types of Poultry House Roofs

The types of poultry-house roofs in common use are shown in Fig. 23. Choice between them is determined by the width of the building, the use to which it is to be put, and the personal preference of the builder as to appearance, etc. Shed roofs are by far the most common, with gable roofs probably second in popularity. Monitor roofs are seldom used except where there is to be a passageway through the middle of the house with pens on each side. The combination roof is employed mainly on wide houses, the object being to secure sufficient pitch with minimum height. The semi-monitor roof provides a means of getting direct sunlight into the rear of the house in combination with a low front. A-shaped roofs are in use mainly on small colony houses. (See Fig. 52.)

The poultry-house roof must, of course, be watertight, and should have sufficient pitch to carry off rain promptly. A common mistake made by amateurs is to provide too flat a roof. In such cases it is quite difficult to make the joints entirely watertight without the lavish use of roofing cement, and it is better to provide a good slope in order to make certain that there will be no trouble from this cause.

Under ordinary conditions shed roofs are cheapest and most practical up to a width of about sixteen feet. Houses sixteen to twenty feet in width can be built with shed roofs, but combination roofs are generally preferred

FIG. 16—A SUBSTANTIAL FRAME FOR SHED-ROOF HOUSE

This diagram shows in detail the ordinary method of framing a shed-roof house to be covered with tongue-and-groove siding. The use of double timbers for sills, plates and corner studs is optional. Reproduced from Ohio State University Extension Bulletin.

for wide houses, as they provide sufficient pitch without making the front excessively high.

Where a straw loft is to be provided, a gable roof is most satisfactory, giving it approximately one-third pitch. By one-third pitch is meant a roof in which the perpendicular distance, or the "rise" from the top plate to the ridge, is one-third the width of the house. For example, one-third pitch in a building twelve feet wide, would call for a ridge four feet higher than the top plate. Shingles should not be used where the pitch is less than one-third. Metal roofs are seldom used, as they do not last long, are cold in winter and hot in summer, and offer no special advantages.

In some sections of the country it is customary to use unsurfaced sheathing boards for the roof, but the practice is not truly economical. Prepared roofing will wear better on smooth surfaces; moreover, surfacing reduces the boards practically to uniform thickness, which is a distinct advantage. When unsurfaced boards are used there often are sharp corners resulting from joining boards of unequal thickness, which will quickly cut through the best of roofing fabric. The sheathing should be looked over carefully before the roof is laid, and all sharp corners should be smoothed off with a block plane if the trouble cannot be

FIG. 17—FRAMING HOUSE FOR COMBINATION ROOF

Note method of tying front and rear rafters to prevent spreading. In wide buildings many prefer to use girders under the ridge, with supporting posts. Reproduced from Ohio State University Extension Bulletin.

corrected in any other way. See to it also, that there are no nail heads sticking up, and cover all knot holes and weak places in the boards with pieces of tin. In cold climates it pays to use T & G boards for sheathing, as the open cracks left between the edges of unmatched boards will permit serious waste of heat.

The great majority of poultrymen use prepared roofing, and this material is entirely satisfactory for the purpose, if of good grade. It seldom pays to use cheap roofing, especially tarred paper in which the upper or weather side is liable to shrink and draw away from the nails, making a weak place in the roof and causing its rapid deterioration.

FIG. 18—PAPER LINED WALL

There are various methods of finishing the eaves of the roof, some of which are shown in Figs. 21, 22, 24 and 34. A common method is to omit the eaves altogether, as in Fig. 22, simply lapping the roof down over the edges all around. This method of construction results in all the roof water running down the sides of the building, which may or may not be objectionable. It is a cheap and easy method and makes

FIG. 19—PRACTICAL METHOD OF LOW COST CONSTRUCTION.

the upper part of the building draft-proof, but nothing can be said for it from the standpoint of appearance.

The method of construction shown in Fig. 24, in which the rafter is cut off square with the plate—the only eave provided being a four or five-inch projection of the roofing boards—is simple, makes a tight joint all around and looks better than the method shown in Fig. 22. Where a wider eave is desired, the plan shown in Fig. 21 is satisfactory and can be secured with the minimum of labor in sawing and fitting the rafters. With this method it is necessary to notch the siding boards to secure a tight joint at the rafters. In some instances, this precaution is omitted and the space between the top plate and the roof boards is left open for ventilation, but this practice is not to be recommended, as it usually means a cold, drafty house in winter.

A convenient way of providing an eave for a watershed without extending the rafters is by laying a double

FIG. 23—DIFFERENT TYPES OF POULTRY HOUSE ROOFS

A, shed roof; B, combination roof; C, gable; D, monitor; E, semi-monitor; F, A-shaped. Reproduced from Farmers' Bulletin 574, U. S. Department of Agriculture.

ground (see Fig. 5), the eave drip will soon wash the filling away, making access to yard doors more difficult from the outside, and may weaken the foundation or floor.

Doors and Windows

All poultry-house doors should be of ample size for ease in carrying in food, litter, etc., and in cleaning out. If the house consists of more than two pens, the door should be wide enough to admit a wheelbarrow. Poultry-house doors, as a rule, may be of simple construction, consisting of tongue-and-groove boards nailed perpendicularly, with a batten at top and bottom and a cross brace. If hung to swing out, such doors may be made storm-proof with little trouble. See Fig. 26.

There are various types of yard doors in use, one of which is shown in Fig. 25. This door slides up and down, and when properly constructed, will be found very satisfactory. Some will prefer to have these doors hinged to open on the side, and where this is done it will be more convenient, as a rule, to have them open out rather than in.

Where passageways are provided, it is desirable to be able to operate the yard doors from the passageway by the use of cords and pulleys, in which case the door shown in Fig. 29 will be found satisfactory. This door is hinged at the top and slopes back, so that when released it will drop into place by its own weight. It seldom is possible to arrange tight-fitting sliding doors that will not stick in wet weather. This sloping door, however, may be made fairly tight and can be depended upon to work at all times. While it can be pushed open from the outside, it is not at all likely that any animal will do so, as it bears too close a resemblance to a trap.

North of the Ohio River, windows are desirable in all types of poultry-house construction and should be properly located and of sufficient size to furnish ample light and ventilation. A simple and satisfactory method of framing the windows is shown in Fig. 28.

The bottom of the sill of this window is sixteen inches from the floor line, which is a satisfactory height, and in

FIG. 20—COLONY HOUSE WITH SHINGLED WALLS

layer of shingles which project a few inches beyond the side of the building. If the sides of the building are covered with prepared roofing, the upper edge should be lapped over onto the roof sheathing before the shingles are laid, thus making a thoroughly draft-proof joint.

No provision has been made for eave troughs or spouting either in the plans or bills of materials presented in this book. It is highly desirable to provide such, however, especially along the fronts of permanent laying and brooder houses. When this is done the fowls and chicks will have a dry strip outdoors in rainy weather, of which they will make full use. When this provision is neglected, they invariably get badly soaked by the drip. If earth is graded up along the front for any reason, as in the case of a house located on sloping

FIG. 21—RAFTER EXTENDED TO FORM EAVE

FIG. 22—A ROOF WITHOUT EAVES

FIG. 24—RAFTER CUT FLUSH; EAVE FORMED BY ROOF BOARD

all cases where practicable, a two-sash window is recommended, as shown. There are various methods of placing window sash, but none that are any more convenient or practical than where the upper sash is hinged to the lower so that it can readily be opened for additional ventilation.

No special framing is required, aside from having two studs on either side of the window and allowing the siding to extend one inch beyond the studs. The lower sash of the window is held tight against the siding by a weather strip, and the upper sash is held in place by a hook or wooden button. The lower rail of the top sash and the upper rail of the lower sash should be sloped as shown, in order to make a water-tight joint. It pays to provide a substantial sill for all windows.

Where a single sash is used, a convenient way to install it is illustrated in Figs. 30 and 32, the latter showing the manner in which the sash is dropped when the window is to be opened. The sill (A) should be high enough above the floor to permit upper sash rail (F) to drop below inside edge of sill. B is a weather strip holding bottom of sash (E) in place when closed, while C holds the top rail. D is the side stud to which

strip G is nailed, the purpose of the latter being to hold sash in place when it is opened.

It is not desirable to have windows down too near the floor. If low enough to let the hens see out, it will make them restless when they must be confined. Low windows also tempt the hens to huddle in the sunlight in front of the window, thus exposing them to drafts.

When warm weather comes in the spring, the windows should be removed entirely in order to provide additional ventilation. For this reason the front of the window opening should be covered with $\frac{3}{4}$ -inch poultry netting to keep the fowls in and to prevent sparrows from entering. If sashes with large panes are provided, the inside of the window also should be covered

with netting in order to avoid breakage, which is liable to result from the fowls flying up against the windows.

About one square foot of glass to fifteen square feet of floor space will be found ample for lighting the poultry house. In cold climates it may be desirable to increase this to one foot in ten. More than this is not advisable under any condition. Sufficient light is provided by the proportion of glass just suggested, and anything in excess of this is not only an added source of expense, but is detrimental, causing irregular temperatures. On bright days the large amount of sunshine admitted makes the pens unnecessarily warm, while at night the heat is radiated rapidly, creating a cold house, and condensing the moisture in the building, causing dampness or "sweating." The same objection applies to skylights. Being at the highest part of the room usually, they allow warm air to escape, and in warm weather make the house hot; also, they almost invariably leak.

In the case of houses sixteen feet wide or more, windows in the rear wall under the droppings platform are desirable. They light up what otherwise is a comparatively dark section of the floor, and where they are provided the troublesome tendency of the litter to work back to the rear of the room is checked.

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Muslin Shutters and Curtains

The use of muslin shutters for ventilating poultry houses is now well-nigh universal, and no better method is known. With the east, west, and north walls of air-tight construction, good-sized openings can be provided on the south side, giving the fowls ventilation, sunlight, etc., with complete protection from drafts. These openings are protected by muslin shutters or curtains, to be closed in stormy weather and at night. Mus-

FIG. 27—CONSTRUCTION OF YARD DOOR

Door is built up of 4-inch T & G boards, with edges bound by 1-inch cleats. An easier but less attractive method is to nail 2-inch cleats across back of door at top and bottom.

FIG. 26—DETAIL OF DOOR FRAMING

Poultry house doors should be hung to swing out and not in. Door illustrated above closes tight against sill and, with drip cap properly installed over the top, is practically storm-proof. If no casing is used around the opening, door can be hung flush with siding.

FIG. 28—CONSTRUCTION OF WINDOW

Sash closes tight against siding, which overlaps opening one inch all around, making a tight joint and reducing cost. Where the sashes come together, bevel the edges to slope outward and make water-tight joint, instead of leaving them level as shown in illustration.

lin affords fairly good ventilation in cold weather, though it does not provide for a very rapid exchange of air in warm weather and is practically air-tight when wet.

In order to get the best results with curtain-front houses, more or less adjustment of the curtains or shutters is required.

FIG. 29—SELF-CLOSING YARD DOOR

In a properly constructed house there is little danger of fowls being injured by cold, so long as the temperature does not drop down to zero or below. However, the amount of cold that the fowls can stand without injury, or without having the egg yield affected, depends largely upon whether or not they have been properly accustomed to open-front conditions.

For the section lying between the Ohio River and the Great Lakes, one square foot of muslin to ten or twelve feet of floor space generally will be found satisfactory for laying houses that are constructed as directed in this book. This is with the understanding that the shutters or curtains will be left open all the time in warm weather, and when the sun is shining even in winter weather, so long as the temperature does not drop lower than ten to fifteen degrees above zero. In stormy weather or in lower temperatures, the openings must be closed.

South of the Ohio River it is safe to omit all sash and increase the proportion of muslin-covered openings to one square foot to eight of floor space. Several different methods of installing fronts have been tried out, but nothing is as satisfactory as the use of frames made of 1x3 inch strips, and hinged at the top so that they can be swung up inside and held out of the way by means of hooks and eyes.

These frames, being of rather light construction as a rule, should not be too large. 3x4, 4x4 or 4x6 feet are practical sizes. Nothing is better for covering than a good grade of heavy unbleached muslin. There is no advantage in using waterproof muslin unless the opening is directly exposed to severe storms. The material used in the waterproofing closes the pores and practically defeats the purpose for which the muslin is used.

FIG. 30.
DROP
SASH IN
PLACE

Where the top of the opening is considerably below the rafter plate, a convenient way of hanging the shutter so as to have it entirely out of the way when open, is to use side strips long enough to reach to the plate, hinging them as shown in Fig. 31.

With hinged shutters there usually is no way of adjusting the size of the opening, the shutter being kept

closed or wide open. In a house having several shutters, a degree of adjustment may be secured by leaving some closed, opening only as many as are necessary. One way of making the shutters adjustable is illustrated in Chapter VII, on page 77. In this case the shutter is made in two parts, hinged together so that the upper part may be left open while the lower half is closed. Another method of securing an adjustable shutter is shown in Chapter VI, where the frame is arranged to slide up and

FIG. 31—MUSLIN-COVERED SHUTTER WITH EXTENSION RAILS

down, and may be fastened at any desired height by means of a hook screwed into the top, and catching in the netting back of the shutter.

The house shown in Fig. 34, one of the buildings on the Poultry Plant at the University of California, provides for an unusual degree of shutter adjustment. Each shutter is made in four narrow vertical sections hinged on the side to swing out. By opening one or more of these, any desired adjustment in ventilation may be secured. In windy weather the sections that open back against the wind can be fastened in position to act as windbreaks. All the sections of a shutter are enclosed in a substantial frame which is hinged at the top to swing out. When fastened in the position shown on the right side of illustration, the shutter acts as a sunshade. This style of shutter is well adapted for use where the summers are hot, or where wide variations in temperature make an unusual degree of adjustment especially desirable.

Substitutes for Shutters

Where large openings are to have muslin protection, loose curtains are considered more desirable by many. As a rule, these are provided with small metal rings at suitable intervals, top and bottom, these rings sliding on wires. With the curtains on the outside of the building, they do not flap much in the wind, but are simply blown back against the wire netting which encloses the opening. These curtains appear to last almost as long as the muslin on inside frames. The house shown on page 49 is equipped with muslin curtains in the manner just described.

One of the objections to the use of muslin shutters and curtains for ventilation is that they require frequent adjustment in changeable weather. Failure to open them on warm days, or to close them promptly when the

FIG. 32.
DROP
SASH
OPEN

temperature drops suddenly in winter, may lead to more or less serious consequences. As a means of securing ventilation without the necessity for making such adjustment, louvered ventilators (shown in Fig. 35) are recommended by the Missouri State Poultry Experiment Station. These ventilator openings are adapted in size to the dimensions of the house. For one having four hundred square feet of floor space and accommodating one hundred to one hundred and twenty-five hens, the Missouri Station recommends four ventilators each three feet square. The horizontal slats are 1x6 inches, set at an angle of forty-five degrees. The distance between each of the slats is one and one-half inches.

It is claimed for these shutters that the storm will not beat in, while ventilation is unobstructed at all times. In practical use, however, it has been found that snow

will sift through under some conditions and in exposed locations there is trouble from drafts, for which reason the openings sometimes are fitted with muslin shutters for winter use.

As a means of securing the advantages of the Missouri shutter without the above-noted objections, the Poultry Department at Cornell University has originated the Cornell Wind Baffle, illustrated in Fig. 36. In a house having approximately five hundred square feet of floor space, three of these bafflers are recommended, making them three feet deep and cutting the slats 27½ inches long. Secure the slats in place by nailing them through the side pieces, using No. 5 finishing nails. The bafflers, after they are made, are slipped into openings between studs suitably spaced and are held in place by a few small nails. The following bill of lumber will supply material for three wind bafflers

FIG. 34—LAYING HOUSE WITH DIVIDED SHUTTERS
Photo from University of California.

of the dimensions just noted, which will provide sufficient ventilation for a house 16x30 feet.

- 11 pieces, ¾ inch x 3 inch, 16 feet long.
- 6 pieces, ¾ inch x 1½ inch, 16 feet long.
- 1 piece, 9-16 inch x 4 inch, 10 feet long.
- 1 piece, 9-16 inch x 4 inch, 12 feet long.

One serious objection to both the Missouri shutter and the Cornell wind baffle is that neither one admits much light, for which reason it is necessary to provide considerably more window space than is required where muslin shutters are used.

Rear Wall Ventilators

In poultry houses that are equipped with muslin fronts or slatted openings, no other ventilation is required, except in hot weather, when rear ventilators, such as are shown in Fig. 37, page 22, will be found decidedly helpful. These ventilators extend the entire length of the building, close up under the eaves, and in the south may open directly into the room and may be made as much as twelve inches wide. The perches, however, should be far enough below the opening so that the fowls on the roost will not be in a direct draft. In the north this opening is made four to eight inches wide, and the wall and ceiling about the perches should be ceiled as shown. The ceiling boards should be of sound tongue-and-grooved stock and should extend from the underside of the droppings platform up the rear wall and along the rafters to a point twelve to eighteen inches in front of the outer edge of the platform. The ceiling must be carried around the rafter plate on short furring strips, reaching diagonally from the rear wall to the rafters, so that there will be no obstruction to the circulation of the air. The outside opening should be provided with doors that can be closed tight in cold weather. These doors may consist of inch boards of suitable width. They should not be over six to eight feet long, as a rule, as they are liable to warp if too long, and in that condition will not close the opening tightly, which is quite important in cold weather. When glass sashes are provided under the droppings boards, these may be removed in hot weather, adding greatly to the comfort of the fowls. For cross section of house equipped with rear ventilator, see Fig. 62, page 37, also see Chapter X for detail drawing.

Straw Lofts

In cold climates, straw lofts are especially desirable and well worth the additional cost of providing them. A practical type of straw loft is indicated in Fig. 79. This heavy blanket of straw not only retains warmth,

FIG. 33—CROSS SECTION OF SHUTTER OPENING

Allow siding to overlap stud one inch on each side to make a tight joint around shutter.

FIG. 35—LAYING HOUSE WITH LOUVERED VENTILATOR
Photo from Mo. State Poultry Exp. Station.

making the house more comfortable in winter, but also makes it cooler in summer. The straw also absorbs moisture and helps to keep the house dry. Where straw lofts are used, louvered ventilator openings should always be provided in the gables, thus permitting the gradual passage of air through the straw and out at the gables. See pages 45 and 46 for plans for a straw-loft house.

King Ventilating System

In brooder houses and in buildings of special construction, where muslin fronts are not desired, the method of ventilation shown in Fig. 38, known as the King Ventilating System, will be found practical and satisfactory. In this the air is admitted to the intake near the ground and passes up between the inner and outer walls, where the building has a double wall, or in a specially provided flue in single-walled buildings, and thus enters the building near the ceiling, as indicated by the arrows. A centrally located flue, the opening to which is about a foot above the floor, carries the foul air out through a louvered ventilator in the roof. Where this system of ventilation is adopted, the cross section of both intake and outtake should provide about four square inches per adult bird, or

FIG. 36—CORNELL WIND BAFFLER

in that proportion. The air circulation is controlled by the adjustable doors at the top of the intake flues, and a door is also provided in the outlet flue near the ceiling, for supplementary ventilation in hot weather.

Building Temporary Poultry Houses

The labor cost of building poultry houses always amounts to a large part of the total expense, though this fact is often overlooked when the poultryman himself does the work. In fact, the common tendency to place no money value on special work done by the poultryman or his assistant leads to a great deal of wasted effort. It is a good plan, therefore, to form the habit of placing a definite valuation on time, either by the day or the hour, systematically charging the same against all work performed. This practice will bring about a very different estimate of the actual worth of things done and particularly will be found to discourage temporary expedients, which invariably cost all out of proportion to their practical value.

For example, in planning cheap, temporary buildings or shelters, the poultryman should consider not only the actual cost of materials, but of his labor as well, and also should make a careful estimate of the length of time that

FIG. 37—REAR VENTILATOR AND WINDOWS

House here illustrated is provided with rear ventilator extending entire length of building, immediately under eave. Also has single-sash windows next to floor. This greatly improves the lighting under droppings platform, and with ventilators and windows both open in summer the house will be about as cool as it is possible to make it. Photo from Mo. State Poultry Exp. Station.

they may be expected to last, and the cost of keeping them in repair during that time. If this is done there will be vastly fewer of the makeshift structures that disfigure so many poultry plants at present. There is no question about the fact that, under average conditions, a well-built, permanent house is cheaper in the long run than the succession of cheaper structures that would be required to answer the same purpose for the same length of time. It is not meant by this to condemn as impractical, all temporary structures for poultry uses. There are many practical conditions under which these are required; but both sides of the matter should be looked into before making such investments.

The poultryman who has decided that a temporary building is needed, should consider carefully the kind and quality of materials that are to be used in it. It is as impractical to use high-grade lumber or heavy roofing on a building that is only expected to last two or three years, as it is to use the inferior material or one-ply roofing on one that is expected to be permanent. In the one case material is wasted, and in the other, labor. In putting up temporary structures, true economy lies in placing a definite estimate upon the period for which they are to last and then selecting the cheapest suitable material which will give that length of service.

Hardware

In the various bills of materials presented, the kind or quality of hardware required is not specified aside from a few details such as hinges, hooks, etc. A few general suggestions on the subject here may prove helpful to the inexperienced. In setting up ordinary framing timbers 20-penny nails are regularly used, though a few 40-penny spikes come in handy now and then. For nailing sheathing boards, T & G siding, and $\frac{3}{8}$ -inch lumber generally, 8-penny nails are used. For rough, unsurfaced boards, which run one inch or over in thickness, it is better to use the 10-penny size. For $\frac{1}{2}$ -inch lumber, such as strips for cracks, etc., use 6-penny nails. Shingles are laid with 4-penny nails, galvanized if obtainable. Lathing nails (2-penny) are handy for a variety of uses and a few should always be on hand. Size mentioned above apply to either wire or cut nails, the former being employed almost exclusively, as they are cheaper, easier to use, less liable to split the lumber, and more readily obtainable.

There is little occasion for using casing or finishing nails in poultry-house construction, but when neat work is to be done they will be called for. In making shutter frames, feed hoppers and, in general, wherever thin lumber or narrow strips are to be employed, box nails which are of smaller diameter than ordinary nails of the same length, can be used with less danger of splitting the wood. Where they cannot be obtained it sometimes is practicable to use casing nails which also are of smaller diameter than headed nails.

For attaching light-weight poultry netting to fences, etc., ordinary netting staples are satisfactory, but if wire heavier than 16 gauge is used it is better to get regular fencing staples. On shutter frames and generally where the lumber is liable to split, double-pointed carpet tacks are much more desirable than netting staples. They hold the netting securely and do not split. For tacking mus-

latter have very thin heads and are hard to pull out when making repairs. For fastening doors, windows, etc., screw hooks and eyes are invaluable, and the 2-in. size is most convenient in a majority of cases. For adjusting

FIG. 39—CROSS SECTION OF STRAW LOFT HOUSE

swinging windows, various attachments are obtainable, but about the cheapest convenient plan is to use a suitable length of light, flat-link chain, obtainable at any good hardware store.

The various styles of hinges used about poultry buildings include butt hinges, with either tight or loose pins, T-strap hinges, and strap hinges. Butt hinges are employed on all narrow strips, frames, etc. As the screws which fasten these hinges in place are close together and near the edges of the boards, they are quite liable to split out and it is not advisable, therefore, to use them if strap hinges can be employed instead. Loose-pin butt hinges are used only where it is desirable to be able to remove the hinged section without taking out screws, and where the hinges are in a vertical position. Be particular to specify tight-pin butts in hinges to be placed horizontally, as in windows, shutters, etc. For partition doors between pens, it is desirable to use double-acting hinges. The smaller hardware stores, as a rule, only handle the heavy, expensive styles used in dwelling houses, but comparatively inexpensive ones are made and can be secured on direct order if the purchaser insists upon it. For large outside doors, strap or T-strap hinges are commonly used. If the door is regularly framed, loose-pin butt hinges (4 to 5-inch size) may be used, but are more trouble to install. A 6 to 8-inch safety hasp usually is preferred to any other form of door fastener.

Paint

The improvement in appearance which results from having well-painted buildings would alone be a sufficient reason for painting all exposed wood work. In addition to this, however, paint adds greatly to the life of the building, particularly if cheaper grades of lumber are used. Such lumber will deteriorate rapidly if not protected. It is true economy, moreover, to use paint of good quality, mixed with linseed oil, rather than to apply cheap paint which always is composed of distinctly inferior materials. "Cold-water" paints, whitewash, etc., may be used and will add appreciably to the appearance of buildings, fences, etc., but have not the preservative value of good oil paint, and require renewal at more frequent intervals.

"Whitewash can be made by slacking about ten pounds of quicklime in a pail with 2 gallons of water, covering the pail with cloth or burlap and allowing it to slake for one hour. Water is then added to bring the

FIG. 38—KING VENTILATING SYSTEM

lin to frames, 4-oz. carpet tacks are heavy enough, but if duck or burlap is used it will be better to employ the 8-oz. size. Cut tacks are preferable to wire tacks as the

whitewash to a consistency which may be applied readily. A weather-proof whitewash for exterior surfaces may be made as follows: (1) Slake 1 bushel of quicklime in 12 gallons of hot water; (2) dissolve 2 pounds of common salt and 1 pound of sulphate of zinc in 2 gallons of boiling water; pour (2) into (1), then add a gallon of skim milk and mix thoroughly. Whitewash is spread lightly over the surface with a broad brush.*

A cheap and fairly satisfactory "paint" can be made by stirring Portland cement into skim milk until the mixture reaches the consistency of thick cream, when it can be applied with an ordinary paint or whitewash brush. It can be made in various tints by adding lamp black, venetian red, ochre, and various other coloring substances as desired.

Tools

The poultry keeper usually does more or less of his own carpenter work, as he finds that, with a little experience, he can do satisfactory work, and at much less expense as compared with the cost of having it done by a carpenter. Most persons, however, make the mistake of attempting to do such work with a too-limited assortment of tools, or with tools of inferior quality. The poultry-keeper cannot afford to neglect providing a complete outfit of tools, and should have a regularly equipped workshop if at all possible.

Attempting to do carpenter work without the proper tools, or with tools that are dull, rusty and generally unfit for use, is not true economy under any condition.

To be able to do any kind of construction work efficiently, the following tools will be found practically indispensable: ax, hammer, hatchet, set of chisels, from $\frac{1}{4}$ in. to $1\frac{1}{2}$ in., mallet, brace and set of bits, 2 screw drivers, large and small, block plane, jack plane, spirit level, plumb bob, steel square, rip saw, crosscut or hand saw, compass saw, monkey wrench, pliers, oil stone, 2-foot pocket rule, portable iron vise, $\frac{1}{2}$ -pt. oil can, chalk, chalkline, drawknife.

In the shop there should be a good-sized carpenter's work-bench with a wooden vise, a bicycle grindstone, and a small geared emery or carborundum stone. In order to be able to take care of the various repair jobs that often are called for about the average home

* Extract from Farmers' Bul. 574, U. S. Dept. of Agriculture.

and poultry plant, a few metal-working tools will be found convenient, particularly a set of drill bits in small sizes: $\frac{1}{2}$ -in. and 1-in. cold chisels, metal or tinner's shears, medium-size pipe wrench; small set of S wrenches. The tools when not in use should be kept in a wall cabinet provided with suitable shelves and hooks. It will aid in observance of the important rule of "a place for every tool and every tool in its place" if the cabinet is provided with glass doors so that if any tool is not in its proper place this fact can hardly escape notice.

The foregoing list may appear to be a rather formidable one, but on the average poultry plant every tool mentioned should pay for itself, in time and money saved, before the end of the first year. Having provided these tools see that they are properly cared for. If carelessly used, left lying around, or put away while damp, they will deteriorate quickly and soon become comparatively worthless. It is true economy to get good tools and then keep them in good condition. This includes keeping all edged tools sharp. Dull tools are strength and time-wasters and usually result in much wasted material also. The grindstone should be operated by power if possible. If it must be turned by hand or foot it is doubly important to have a geared emery or carborundum stone for use where the ordinary grindstone cuts too slowly.

Plans Given in Other Books

In order to present the subject of poultry house construction in such a manner as to meet the building requirements of the greatest number, it has been found necessary to limit the plans illustrated and described, to houses for fowls. Permanent brooder houses being an essential feature of every well-equipped poultry plant, these are fully represented, also a number of plans for portable colony houses which can be used for adult fowls, brooder chicks or growing stock. Those who are especially interested in houses of the latter type, however, also in brooders, brood coops, chick runs, and chick-raising equipment generally, are referred to our books on "Artificial Incubating and Brooding" and "The Chick Book." Plans for houses especially designed for ducks, will be found in our book on "Ducks and Geese." Houses for turkeys are described in "Turkeys. Their Care and Management." See page 112.

AN ANNOUNCEMENT

At an early date, we expect to issue a book on "Poultry Plant Construction," devoted primarily to the requirements of large plants. This book will give complete working plans, architect's specifications, bills of material, etc., for modern, down-to-date poultry houses of every kind required on large breeding and commercial plants. It will be printed on extra-size pages, which will make it possible to reproduce plans on a scale large enough to bring out clearly all necessary details of design and construction. The need for a book of this character is unquestioned, and we anticipate a large demand for it. Announcement of exact date of publication will be given later through the usual channels.

FIG. 40—SUMMER SHADES FOR OPEN FRONT HOUSES.
Photo from Purdue University

Economical Back Yard Poultry Houses

Back Yard Poultry Keeping is Profitable When Well-Managed—Laying Out the Plant so as to Utilize Space to the Best Advantage and Protect Health of Fowls—Complete Plans for Building a Number of Inexpensive Houses—Avoid Makeshift Buildings—Even Low-Cost Houses May Be Made Neat and Attractive.

UNDER many conditions the back-yard poultry flock can be made an important means of reducing the high cost of living and may also be utilized as a source of revenue.

Where they are given proper care and attention, the number of fowls that can be kept on a small tract of ground is surprisingly large. Extremely intensive methods of poultry raising are not to be recommended for general adoption—especially for large-scale operations, but it is entirely practicable to follow this method on a small scale, and with good success.

Where a back yard is available, a good-sized flock can be kept to excellent advantage, and the space provided by the ordinary back yard can frequently be utilized with more profitable results in poultry keeping than in any other manner involving no greater outlay.

Few persons realize how much may be accomplished in the space of an ordinary back yard in the production of eggs and fowls for the home table. In one year, a dozen pullets or young hens, fed largely on scraps from the kitchen, should produce 120 to 180 dozens of eggs, having a market value of \$50.00 or more, at average prices. If desired, it is practicable to go a step farther and, in the space of the average back yard, raise a few broods of chicks that will furnish spring and summer fries and roasting fowls for fall and winter use, thus keeping the table supplied with this delicious and wholesome meat a good part of the year and reducing the butcher's bill to a small fraction of what it otherwise would be.

Fowls can be kept successfully in quite limited space, and where it is desirable to do so, the average back yard affords sufficient room for a flock large enough to form an important source of additional income through the sale of surplus eggs and fowls to the neighbors, many of whom will be glad of an opportunity to buy these special quality products, and will cheerfully pay an advance over the ordinary market price for them. All the work of caring for such a flock may be done outside of regular work hours and the time will scarcely be missed.

There are other ways of deriving an income from the back-yard flock, such as the production of standard-bred, exhibition-quality fowls and the sale of eggs for hatching, also day-old chicks. Not only may substantial sums be realized in this way, but the experience thus gained

may be made the basis for the development of an extensive poultry business that will enable the poultryman to drop less profitable or congenial employment and give his entire time to this interesting and comparatively easy work. Many of the most successful breeders of today established their prize-winning strains and laid the foundations for their success within the limits of an ordinary back yard. Remember however, that it is especially important to avoid overcrowding where breeding fowls are kept in close quarters.

Laying Out the Back Yard Poultry Plant

There are various ways of laying out the back yard to accommodate a small flock of fowls, but one convenient manner of doing this is shown in Fig. 42.

Special attention should be called to the fact that the back-yard poultry plant does not necessarily have to be an eyesore. The poultry house can be built in a neat and attractive manner at only a slight increase in cost over ramshackle construction, and when this is done the owner is much more likely to retain his interest in the work.

Temporary, inconvenient structures, hastily and carelessly built, have been responsible for poor results and for loss of interest in thousands of cases where suitable buildings would have encouraged the owner to continue in this most interesting and profitable work. A good illustration of neatness in back-yard poultry house construction is given in Fig. 41. It costs a little more to build in this manner than to put up a "shack" but when built such a house should

FIG. 41—AN ATTRACTIVE BACK-YARD POULTRY HOUSE

Even though only a very limited amount of room is available, it will pay to give the fowls an outdoor run. Above illustration shows how to make a small yard look neat and trim with but little trouble or expense.

require no repairs for many years and without doubt it adds substantially to the value of the property.

Fig. 42 shows how the back yard can not only be utilized for a flock large enough to supply the family table with eggs and fowls practically the year round, but also to produce a surplus for sale at good prices. This can be done without sacrificing the lawn and without making the back yard unattractive.

This plan provides for a poultry house of three pens, each of which will accommodate twenty-five fowls. The amount of yard room allowed is comparatively small, but if the yards are regularly swept and occasionally spaded, they will keep clean and free from odor and, with proper care, the fowls will do as well as on free range. The lawn and the small, separately fenced plot in the rear

will provide room for raising pullets enough to renew one-half the flock each year.

It is planned to utilize the lawn at the side and at the rear of the dwelling for brooding young chicks. If they are not kept here too long, and the brooders are moved at frequent intervals, the lawn will not be injured in any manner by such use. When the chicks are large enough to take care of themselves, they are to be removed to the plot in the rear where small colony houses are provided for them, and where they are to run until the pullets are ready to go into the laying pens in the fall. The cockerels can be kept here, also, until they reach broiler age when, ordinarily, they should be disposed

FIG. 43—FLOOR PLAN OF ELEVATED POULTRY HOUSE

of, the amount of ground provided being insufficient for raising large numbers of chicks to full size.

As sketched in Fig. 42, there is to be a hedge on both sides of the lawn, and the garden plot is cut off from the lawn by a neat screen, to which poultry netting can be fastened if it is desired to make it chicken-tight. The fencing about the poultry yards, of course, will be wire netting, four to six feet high, depending upon the variety of the fowls kept. Fruit trees should be planted in the yards, but probably will not be wanted in the garden. Flower beds can be provided to suit individual taste, and if the plan is carried out as here indicated, the fowls will not interfere in any way with having a most attractive lawn, nor will they make trouble for the neighbors.

In this plan the laying house is located at a convenient distance from the dwelling. It should be hidden by grouping shrubs in the rear, or by a grape trellis as shown. The various features of this back-yard poultry plant are indicated by letter as follows:

AA are outdoor brooders; B, the laying house; C, outdoor runs for hens; D, colony houses; E, yard for growing stock after the young birds no longer need artificial heat in the brooders; F, hedge on each side of the lot, affording windbreak and shade; G, the kitchen garden.

Many town and city poultry keepers do not have a lot large enough for a poultry plant of even the modest dimensions here shown, and must modify their lay-out accordingly. Some may even be reduced to the necessity of using no more space than is occupied by the house and yard illustrated in Fig. 41, and still may find both pleasure and profit in a well-managed flock. On the lot just

FIG. 42—PRACTICAL METHOD OF LAYING OUT BACK-YARD POULTRY PLANT

This sketch shows how to lay out a good-sized back lot where chicks are to be raised, and laying or breeding fowls kept in sufficient numbers to make them a source of income. AA are outdoor brooders; B, the laying house; C, C, L, outdoor runs for hens; D, S, colony houses; E, yard for growing stock after the young birds no longer need artificial heat; F, F, hedge on each side of the lot, affording windbreak and shade; G, the home garden.

FIG. 44—SMALL ELEVATED POULTRY HOUSE.

referred to, no chicks at all can be raised, but a good-sized laying flock is maintained by purchasing early hatched pullets in October, or by November 1st at the outside, and feeding heavily for eggs until production begins to drop off in the summer. Then the layers are filled for table use, and a new flock purchased in the fall. The plot of ground here utilized probably is not over 12 to 15 feet square but, as here utilized, will accommodate a flock large enough to supply all the eggs that will be used by an average family and enough more to pay the cost of all feed purchased.

ELEVATED POULTRY HOUSE

A Low-Cost House With Sheltered Exercising Room Underneath Affords Comfort for the Fowls All the Year.

Where a small flock only is to be kept, simply to supply the home table with fresh, high-quality eggs and possibly a few young fowls for spring and summer fries, the house shown in perspective in Fig. 5 will be found convenient and economical to build. This house stands three feet above the ground, with the space underneath closed on three sides, affording a scratching pen for the hens at practically no additional cost. The space is reached from the floor above by an incline at the back.

In order to make this house warm and free from drafts the floor should be doubled, the sub-floor consisting of sheathing boards laid diagonally, then covered with good, waterproof building paper, and tongue-and-groove flooring laid over this.

This house is to be built with plain boards nailed perpendicular and covered with prepared roofing. The perches are along the west end, assuming that the windows and openings face the south, as will usually be found most satisfactory.

Ventilation is secured by providing a muslin-covered opening, also two small openings in the gable, which should be closed in the winter-time by tacking a heavy piece of cloth over them, but left open in the sum-

mer to make the house cooler and more comfortable. An entrance for the fowls may be provided in the front, if desired, but the rear trap door should always be available for the use in stormy weather, when the fowls will remain below indefinitely rather than use an outside entrance.

Fig. 43 gives a floor plan of this house, Fig. 45 gives a sectional view lengthwise, and Fig. 44 shows a general view. While the dimensions can be varied to suit individual needs, the house as planned is 8x12 feet on three-foot posts. The walls are five feet high and the ridge is eight feet. It will accommodate twenty to twenty-five fowls, or even thirty in a pinch. The following bill of materials will be found sufficient to construct it:

BILL OF MATERIALS FOR BACK YARD POULTRY HOUSE

Use	Size Inch.	L'gth Feet	No. of Pieces	Bd. Meas.	Remarks
Sills	2x6	12	2	24	
Sills	2x6	8	2	16	
Joists	2x6	8	4	32	
Joists	2x4	8	1	5	
Stnds	2x4	10	5	33	1 piece cuts 2.
Plates	2x4	12	3	24	
Plates	2x4	8	4	21	
Support for drop- pings platform...	2x4	8	1	5	
Window sills	2x4	8	1	5	Surfaced and milled.
Perches	2x4	8	2	11	Surfaced, upper corners rounded.
Rafters	2x4	10	7	47	1 piece cuts 2.
Sheathing boards...	1x10	.....	.....	640	
Matched flooring...	1x4	.....	.....	175	
3½ squares prepared roofing.					
100 s. f. sheathing paper for floor.					
2 plain rail window sashes, 1½-in. 6-light, 10x12-in. glass.					
20 s. f. of 1-inch mesh poultry netting.					
10½ s. f. of muslin.					
8 4-inch locust or cedar posts, 5½ ft. long.					
1 pair 8-in. T-strap hinges.					
1 door latch.					
3 pairs 2-inch butt hinges.					
1 chain sash adjuster.					
2 2-inch hooks and eyes.					
Nails, paint, etc.					

With a little more expense, the house can be built with tongue-and-groove siding nailed horizontally. Trimmed neatly and given a couple of coats of paint, it may be made very attractive in appearance and will last a lifetime.

FIG. 45—LENGTHWISE SECTION OF ELEVATED HOUSE

HOUSE FOR ADULT FOWLS OR BANTAMS

A Practical House for Small Back-Yard Flocks. Has Muslin Ventilation, and Well-Protected Perches. Just Right for a Pen of Bantams.

By E. L. POTTER

The drawings at the foot of this page illustrate a convenient and practical house suitable for a small back-yard flock of eight to ten fowls. This house will prove especially convenient for a bantam flock, though it may be used for large fowls with entirely satisfactory results. The curtains in front of the perches should be omitted, as they are of little use except in extremely cold sections of the country or for fowls having extra-large combs. If this house is used as a colony house, it will accommodate twelve to fifteen Leghorns, about twelve fowls of larger breeds, or twenty bantams. It may be built for a small sum, depending somewhat upon the locality and the price of lumber.

In our climate this house has proved warm enough, but in cooler climates I would advise the use of thin sheathing or ceiling, nailed on over a tar-paper lining, or the house may be covered on the outside with roofing material, placing the strips on up and down and using bands on the seams, or simply cementing the edges and nailing it on in the usual way. Following is the complete bill of materials required for building this house:

- 13 pieces of either 2x3-inch or 2x2-inch spruce for the sills, joists, corner posts and intergirts, also rafters.
- 3 pieces, 1½x1-inch furring, 14 feet long, for frame of screens and supports for nest bases and roosts.
- 1 piece, 2-inchx3-inch furring, 14 feet long, for perches.
- 350 feet of tongue-and-groove flooring, either pine or spruce.
- 4 pounds of 3d wire nails.
- 22½ feet of one-ply prepared roofing.
- 1 gallon of paint.
- 2 sashes (6-in. x 8-in. lights), 2 ft. 6 in. x 2 ft. 6 in.
- 110 feet of 2-inch mesh poultry netting if yard is to be covered on top, or in case of only a fence, 94 feet will be enough.
- 2 pounds of staples.

- 4 pieces, 3-inch x 1-inch furring, 12 feet long, for top of yard posts.
- 6 pieces, 3-inch x 8-inch cedar posts.
- 2 pieces, 3-inch x 1-inch furring, 13 feet long, for gate.
- 2 6-inch x 1-inch spruce boards, 12 feet long, for bottom of wire.
- 2 6-inch x 1-inch boards, 13 feet long, for bottom of wire.

The muslin screens in the upper part of the front are movable and should preferably be hung from the top on hinges, so that they can be hooked up out of the way when not in use. In this house the windows should be hinged at the bottom so that they can be dropped in

FIG. 46—CROSS SECTION OF HOUSE FOR 20 FOWLS

Reproduced from Ohio State University Extension Bulletin.

from the top for additional ventilation and during warm weather should be entirely removed.

In a house as narrow as this it is difficult to use muslin shutters without exposing the fowls to direct drafts when on the perches, and for this reason it would seem that the perch curtain should not be omitted. A practical method of protecting the fowls from drafts under such conditions is to fasten the curtain in the position shown in the diagram, so that it will act as a screen,

FIG. 47—COMPLETE PLANS FOR BUILDING SMALL HOUSE FOR LAYERS OR BANTAMS

without confining the fowls or seriously restricting ventilation.

For numerous plans for small, portable houses which also are adapted to the requirements of back-yard poultry keepers, see Chapter VI.

FIG. 48—FLOOR PLAN OF HOUSE FOR 20 FOWLS
Reproduced from Ohio State University Extension Bulletin.

A HOUSE FOR TWENTY FOWLS *

An Attractive House for Small Back-Yard Flocks. Practical and Complete in Every Important Detail.

The house shown in Figs. 46, 48 and 49 has been designed especially to satisfy the needs of the poultryman who keeps only a small flock for the purpose of producing poultry and eggs for the home table. It provides sufficient room for twenty fowls.

This house is also well adapted for use as a breeding house. If equipped with heavy runners and a board floor, it makes a convenient colony house which may be moved easily by one team from one part of the farm to another.

FIG. 49—A HOUSE FOR TWENTY FOWLS—FRONT ELEVATION
Reproduced from Ohio State University Extension Bulletin.

If used as a permanent house, a concrete or tile floor should be used. Two houses of this size and type set close together and connected by a runway, may be used to good advantage with a colony brooder stove for brood-

* From Ohio State University Extension Bul., Vol. 12, No. 2.

FIG. 50—A TWO-PEN HOUSE FOR BACK-YARD FLOCK
ing purposes. One house, in which the stove is set, is used as a nursery room. The other house, which is heated only by the warm air from the nursery which passes through the runway, provides a well-ventilated exercising and feeding room.

BILL OF MATERIALS

Sills (doubled)—84 linear feet, 2x4 in.
Plates—18 linear feet, 2x4 in.
Studs—8 pieces, 2x4 in., 6 ft. long; 8 pieces, 2x4 in., 4 ft. long; 10 pieces, 2x4 in., 6 ft. long.
Rafters—6 pieces, 2x6 in., 12 ft. long.
Outside sheathing—280 feet B. M. drop siding.
Roof sheathing—130 feet B. M. 1x8 in.
Thim lumber—200 feet 1x4 in. pine, dress.
For screens—50 feet, 1x2 in.
Two window frames with sash.
Two squares prepared roofing.
100 feet dressed and matched sheathing for ceiling back of perches and overhead.
This does not include roosts, brood coop, etc.

A TWO-PEN BACK YARD HOUSE

A Modern Curtain-Front Two-Compartment House Especially Well Adapted to the Needs of Back-Yard Breeders.

A thoroughly satisfactory house, where two or more flocks are to be kept, is illustrated in Figs. 50 and 51. It can be built in any length, but is shown here with two pens. The house is twelve feet in depth and eighteen feet in length, making each pen nine feet wide and providing room for about fifty hens, or seventy-five in a three-pen house. Such a house as this should be built about seven

FIG. 51—FLOOR PLAN OF TWO-PEN HOUSE

Nests are placed under droppings platform. Perches are supported on cross bars, hinged at back to swing up. For details of construction of partition, nests, and water platform, see Chapter X.

feet high in front and five feet high in rear, with shed roof and concrete wall and floor. The windows and muslin-covered openings are designed for a moderately cold climate, such as is found in the latitude of New York or Chicago. For use in colder climates the size of the muslin-covered openings should be somewhat reduced, while

FIG. 52—PLANS FOR A-SHAPED BACK-YARD POULTRY HOUSE

This nest and attractive house, designed by C. C. Holmes, is well suited for back-yard use. It is low in cost, comfortable and well ventilated. It can be employed with equal satisfaction in brooding young chicks, using either lamp or stove-heated hovers. Where desired this house can be built in sections so that it can readily be taken down for easy moving. Detail drawing in upper right-hand corner shows method of putting sections together with hinges and hooks. Other details and drawings show method of supporting perches, and location of nests under droppings platform. Sufficient room is left between platform and wall on either side to give access to the nests.

for warmer climates they may be increased and the glass windows omitted entirely if preferred.

This house, as planned, is to be built of tongue-and-groove siding, nailed to studs placed two feet on centers, and the rafters are to be cut off flush with top plate, and roof boards extended four or five inches beyond the side wall for eaves. Partitions should be made as in Fig. 53, which also gives a general idea of perch construction, droppings platform, nests, water vessels, etc. Fig. 51 shows the floor plan. Whether the concrete floor shall be finished level with the top of the foundation, or dropped two or three inches below, as in Fig. 53, is largely a matter of personal preference. Dropping it as shown affords some additional protection for the sills in damp locations.

To build this house (two pens) the following bill of material is required—totalling about 1,500 sq. ft. of lumber. For three or more pens, materials will have to be increased proportionately.

BILL OF MATERIALS FOR 12x18 FOOT LAYING HOUSE

Use	Size Inch.	Length Feet	No. of Pieces	Rd. Meas.	Remarks
Sills, sides	2x4	18	2	24	
Sills, ends	2x4	12	2	19	
Plates	2x4	18	2	24	
Studs, front	2x4	14	5	47	1 piece cuts 2
Studs, ends	2x4	10	5	33	1 piece cuts 2
Studs, ends and headers	2x4	14	7	54	Cut to fit.
Studs, partition	2x4	14	2	19	1 piece cuts 2
Rafters	2x5	14	10	117	
Support for drop plat., front	2x4	18	1	12	
Support for drop plat., back	1x4	18	1	6	
Perches	2x4	8	4	21	Upper corners round, surfaced four sides.
Sills for windows	2x5	6	1	5	Surfaced 4 sides and milled.
Sills for shutter opening	2x5	8	1	7	Surfaced 4 sides and milled.
Roof boards	1x10	.....	.....	280	
T & G siding	1x6	.....	.....	410	
Flooring boards for drop/g platform, doors, partitions and ceilings	1x4	.....	.....	185	
Facing, casing, etc.	1x4	.....	.....	160	lin. ft. Surfaced
Outside dr. frame	1x5	.....	.....	20	
Frame for muslin shutter	1x3	.....	.....	25	" " " "
Strip under shutters	1x2½	.....	.....	8	" " " "
Strip under windows	1x1½	.....	.....	5	" " " "
Strips for small doors and win's	1x1	.....	.....	25	" " " "

2½ squares prepared roofing.

- 4 plain rail window sashes, 1½-in., 6-light, 8x12-in. glass.
- 40 sq. ft. 1-inch netting for doors and ventilators.
- 30 sq. ft. muslin for curtains.
- 4 anchor bolts, ½x12-in. with 2-in. washers on each end.
- 1 pr. 6-inch T-strap hinges for outside door.
- 1 pr. 6-inch hinged safety hasps.
- 1 pr. 2-way spring hinges for partition door.
- 4 pr. 2-inch butt hinges for muslin frames and windows.
- 2 pr. 4-inch strap hinges for ventilator doors.
- 2 chain sash adjusters.

MATERIAL FOR NESTS

Use	Size Inch.	Length Feet	No. of Pcs.	Rd. Meas.
Front base	1x6	8	2	8
Doors	1x7	8	2	9
Partitions	1x11	12	2	22
Base, back	1x4	8	2	5
Strips for top of nests	1x2	8	2	3
Bottom boards	1x12	8	2	16
Running boards	1x4	8	2	5
Uprights	1x4	12	1	1
Brackets	1x3	8	2	4

This house may be built more cheaply by omitting practically all studs and using rough boards nailed on up and down, and covering the outside wall with a good grade of prepared roofing.

A concrete foundation and floor are particularly recommended for back-yard flocks, making them as shown in Fig. 11, so rats will be completely excluded. The house will be warm and dry and it can be easily cleaned and disinfected.

A-SHAPED BACK-YARD HOUSE

This A-Shaped House is Neat and Inconspicuous. Will Not Be Out of Place On Any Back Lawn.

By C. C. HOLMES

Recently we moved from a small town where land is plentiful and cheap, to a large city where poultry raising is almost impossible for lack of proper facilities, and it has been a serious problem to us as to how we could overcome the difficulties.

After making several sketches in my attempts to devise a suitable poultry house I have come to the conclusion that an 8x8-foot house such as is illustrated here, is most practical for the back-yard poultry keeper who has to live within city limits. It is convenient, moderate in cost, quite neat in appearance, and if made in sections and hinged as indicated, may readily be taken down and moved to a new location.

As the accompanying drawing (Fig. 52), is quite complete, it will not be necessary to go extensively into details. The floor plan indicates the way in which the windows are arranged to swing in. As will readily be noticed, the droppings board does not extend entirely across the

FIG. 53—PARTITION FOR TWO-PEN BACK YARD HOUSE

This is a good type of partition to use when the laying house is to be divided into two or more pens. It protects the fowls from drafts, both on the perches and on the floor, but allows free circulation of air through the house. Note that the foundation is carried up above the ground level and the cement floor is thus making it warm and dry. Floor is two inches below the top of foundation and the corners are rounded to prevent filth collecting at this point.

back of the building, but a space is left between it and the side walls to give access to the nests, which are reached by doors opening out into this space. There are four nests, two on each side, and the hens enter them from the back, under the droppings board. The upper part of the front is enclosed only with poultry netting to be covered in winter with muslin or cheese cloth, where winters are extremely cold, or for more complete protection of valuable breeding fowls with extra-large combs.

As here illustrated this house is to be built in sections, held together by means of hinges and hooks as shown in detail drawing in upper right-hand corner. Unless the building is to be moved long distances, however, it will be stronger and more durable if firmly nailed together in the usual way.

There was enough waste allowed to build the droppings board, the nests, etc., and the cost of material at the time this house was built was \$13.00. The cost of

INEXPENSIVE BACK YARD POULTRY HOUSE

This House is Especially Planned to Secure Low Cost.
Is About As Inexpensive As it is Worth While
to Try to Build.

A plan for a small house that can be built about as cheaply as it is worth while to build at all, is shown in Figs. 54 to 57. This house was designed by the Poultry Division, U. S. Department of Agriculture. It is 8x8 feet and will comfortably accommodate 10 to 15 fowls, or even 20 with a little crowding. Such a house, properly constructed of good materials, will be servicable for many years with little cost for repairs.

FIG. 57—FLOOR PLAN OF INEXPENSIVE HOUSE FOR BACK-YARD FLOCK

Reproduced from blue print furnished by Poultry Div.
of U. S. Department of Agriculture

The average person will find it desirable to make both front and back six inches to one foot higher than as shown in plan, and if the house is intended to be portable it will be much better to put in a board floor. If to be used in a damp location a board or concrete floor is a necessity.

Where the 2 inch strips used in covering the cracks are expensive or hard to get, as is often the case, it is better to omit them and cover the walls on the outside with a good grade of prepared roofing. In cold climates it will pay to provide one six-light glass sash in the front or at one end, to light the house on dark days or when the muslin shutter must be left closed on account of severe cold.

The only really essential fixtures for this house are perches, droppings board, and nests. It will pay, however, to provide a feeding platform also, where the water vessel, dry mash, grit and shell hoppers may be located. The width and length of this platform will depend upon the dimension of the vessels or hoppers used, but should be roomy enough to give the fowls convenient access to them. It should be about two feet above the floor so that there will be scratching room underneath and so that litter will not be thrown into the vessels. Those who have not tried elevating the water and food holders can hardly realize how much time and trouble is saved by so doing.

BILL OF MATERIALS

The following list includes everything needed to build this house as here described:
8 brick, stone, or concrete block piers, or solid concrete foundation.
4 pieces 2 in. x 4 in. 8 ft. long, for sills.
3 pieces 2 in. x 4 in. 10 ft. long, for corner studs and mls.
5 pieces 2 in. x 4 in. 10 ft. long, for rafters.
5 pieces 2 in. x 3 in. 8 ft. long, for perches, drop board, supports, etc.
275 feet, bd. meas. $\frac{3}{4}$ in. x 12 in. boards, surfaced 2 sides, for walls, sheathing and nests.
25 feet bd. meas. $\frac{3}{4}$ in. x 4 in. flooring boards, for droppings platform.
150 lin. ft. $\frac{1}{2}$ in. x 2 in. strips for cracks.
75 sq. ft. prepared roofing.
180 sq. ft. $\frac{3}{4}$ -in. mesh poultry netting, for windows.
1 pr. T-strap hinges, for outside door.
1 8 inch hasp.
1 pr. 2 $\frac{1}{2}$ -inch butt hinges, for muslin shutter.
1 pr. 4-inch strap hinges, for perch support.
1 pr. 6-inch strap hinges, for ventilator.
12 2-inch hooks and eyes.
Nails, tacks, staples, paint, etc.

About the cheapest and simplest nests that can be installed are made of orange boxes as illustrated in Chapter X, but a better way is to build the nests substantially, of good smooth lumber, and place them under the droppings board (see Figs. 116 and 120), where they will occupy no floor space, will keep clean, and will afford a degree of much-desired seclusion for the layers.

Preventing Drafts in Small Houses

Back-yard poultry keepers often find difficulty in protecting fowls on the roost from drafts or air currents in cold, stormy weather, particularly when the wind is blowing more or less directly against the front. This is due to the fact that their houses usually are small and narrow, and the fowls consequently are close to the windows or other openings. This is one reason why it is customary to keep the shutters or curtains closed in much milder weather than is necessary or desirable in houses of standard depth—that is, 16 feet wide or over.

Houses of this type are greatly improved for winter use by the provision of some means of adjusting the size of the open front to meet varying weather conditions. The muslin-covered shutters commonly employed admit of no adjustment, but must either be left wide open or closed tight. One method of providing for this adjustment is to make the shutter in two sections as shown on page 77, so that the upper section may be opened while the lower one remains closed, or both may be opened together when desired. Another way is to arrange the shutter to slide up and down on the outside, working in grooves on each side of the opening, as provided in the house front illustrated in Fig. 125, on page 68. This shutter can be adjusted to give an opening of any desired size, being held in place by a hook which engages the wire netting back of the shutter.

Whatever method of ventilation is adopted, if it permits air currents to flow down the rafters and strike directly upon the fowls on the perches, a screen should be provided. This may take the form of a stationary shutter in front of the perches, or it may be hinged at the top to hook up out of the way when not needed. Frequently it is more convenient to provide a curtain attached to a pole, to be allowed to hang straight down from the ceiling when in use, and rolled up and fastened to the rafters when not needed.

Light-weight burlap is the best material to use for this purpose, as it will prevent drafts without restricting ventilation to a marked extent. The purpose of this screen is not to keep the fowls warm, but merely to protect them from drafts, and for this reason it should not extend lower than about the level of the front perch, and should be employed only when actually needed.

Houses for Commercial Laying Flocks

Advantages of Curtain-Front and Open-Front Houses for Laying Flocks—Muslin Curtains the Best Known Means of Securing Good Ventilation Without Discomfort to Fowls—Plans for Building Single Compartment Houses at Moderate Cost—Suggestions for Special Low-Cost Construction.

THE type of house commonly described by the term "open-front" is generally conceded to be best suited to the requirements of the laying flock and is now used, almost exclusively, by practical poultry keepers in all parts of the world, from the tropics to the far north. When properly designed and constructed, such houses are dry and comfortable, affording the greatest degree of warmth that can be secured without restricting ventilation to an injurious extent. Ventilation may readily and quickly be adjusted to meet changing weather conditions, and the houses are simple and comparatively inexpensive in construction.

The term "open-front," in common usage, is applied indiscriminately to all houses having extensive openings in the front wall, whether provided with muslin shutters or curtains, or protected simply by means of wire netting. The great majority of these houses, however, have muslin curtains or shutters for additional protection in severe cold or storms, and it will be less confusing to speak of such as "curtain-front" houses, reserving "open-front" for the type of house having no such protection.

The Scratching Shed House

The curtain-front house was developed as the direct result of efforts to find some means of overcoming the serious objections to the old-style, warm, glass-front houses, to which reference is made on page 5. During the transition period a type known as the scratching-shed house attained some measure of popularity, chiefly in New England States. It had some advantages over the older type, but it was soon replaced by the curtain-front house. One of the best of these houses is illustrated in Fig. 58, and is thus described by the designer, the veteran A. F. Hunter:

"The plans here given are for a continuous poultry house with alternating pens and sheds, the sheds having curtained fronts and all the space within the house being utilized by the fowls. Each combined pen and shed is 18 by 10 feet, the shed being 10 by 10 feet and the closed roosting pen being 8 by 10 feet, affording room sufficient for 25 fowls of the American or 30 of the Mediterranean varieties. No walk is required, because the walk is through gates and doors, from shed to pen and pen to shed, and so on to the end of the house.

"The ventilation (so much desired) is varied, and can be adapted to the different seasons in half-a-dozen different ways. In summer the doors and windows are all wide open and the curtains are hooked up against the roof out of the way. (It is understood that the doors between two pens are never left open; they are always kept closed except when opened for the attendant to pass through.) When the nights begin to be real frosty in the fall, close the windows in front of pens, but leave shed

curtains hooked up and doors between sheds and pens open. When it begins to freeze at night, close the curtains in front of the sheds, but still leave doors between pens and sheds open. These doors (including slide door), are never closed excepting on nights of severe cold, say five to twenty degrees above zero; for zero nights close all doors and windows, also the curtains in front of roosts. To keep the fowls enclosed when the curtains are raised, cover the front of shed with wire netting. The doors from sheds to pens swing into the pens and are, of course, out of the way of the curtains."

The Maine Station House

While conditions in scratching-shed houses were greatly improved as compared with those of the closed-front type, poultrymen were not long in discovering that

FIG. 58—NEW ENGLAND SCRATCHING SHED HOUSE—FORE-RUNNER OF THE MODERN CURTAIN-FRONT HOUSE

the close, poorly ventilated roosting room had little practical value and in use proved to be only an added complication as well as a needless expense. From this it was only a short step to the general type of house now in common use.

No single individual can lay claim to having given the poultry world the open-front or curtain-front house. However, one of the first houses of this type was built at the Maine Experiment Station, and it served for years as a model for others in all parts of the country. This house is illustrated in Fig. 59. The following description of it is condensed from a Maine Station Bulletin:

"This building was erected in 1903 and is 14 feet wide and 150 feet long. The back wall is 5 feet 6 inches high from floor to top of plate inside, and the front wall is 6 feet 9 inches high. The roof is of unequal span, the ridge being 4 feet from the front wall. The height of the ridge above the floor is 9 feet. The sills are 4 by 6 inches and rest on a rough stone wall laid on the surface of the ground. A central sill gives support to the floor, which at times is quite heavily loaded with sand. The floor timbers are 2 by 8 inches and are placed two feet apart. The floor is two thicknesses of hemlock boards. All of the rest of the frame is of 2 by 4-inch stuff. The building

is boarded, papered and shingled on roof and walls. The rear wall and four feet of the lower part of the rear roof are ceiled on the inside of the studding and plates, and are packed, very hard, with dry sawdust. In order to make the sawdust packing continuous between the wall and roof, the wall ceiling is carried up to within six inches of the plate, then follows up inclining pieces of studding to the rafters. The short pieces of studding are nailed to the studs or rafters. By this arrangement there are no slack places around the plate to admit cold air. The end walls are packed in the same way. The house is divided by close board partitions into seven 20-foot sections, and one 10-foot section is reserved at the lower end for a feed storage room.

"Each of the 20-foot sections has two 12-light outside windows screwed onto the front, and the space between the windows, which is eight feet long and three feet wide, down from the plate, is covered during rough winter storms and cold nights by a light frame, covered with 10-ounce duck, closely tacked on. This door, or curtain, is hinged at top and swings in and up to the roof when open."

After giving the house a thorough and severe winter's test, Prof. Gowell, who was in charge of the Poultry Department at the Maine Station at that time, wrote regarding it as follows:

"I wish I had delayed writing the bulletin till now, for we have just gotten through the coldest weather ever known in this section and the cloth-front house has proved itself equal to the demands made upon it. The 300 pullets were not put in * * * until December 6th, but by the end of that month they had gotten under way and increased every week regularly in egg production all through January and February, and have laid from 160 to 180 eggs every day this month. They came down from the perches and engaged in digging a breakfast out of the straw litter in a way that showed that life was worth living. Every head was blood red. There has not been even a snuffle heard or seen in that house."

The above description was written a good many years ago, but, in the main, it fairly represents the experience of poultrymen generally with the curtain-front house, other conditions being equal. It should be noted in this connection, however, that while in this particular house 10-ounce duck was used for the shutters, poultry keepers generally consider a good grade of unbleached muslin amply heavy for the purpose.

CURTAIN FRONT LAYING HOUSE FOR 100 FOWLS

A Practical House for Commercial or Farm Flocks. Is Well Ventilated, Convenient and Comfortable for the Fowls.

There is no room for argument over the statement that hens will give better average production when housed in comparatively small flocks. The experience of practical poultry keepers, however, is that the saving in labor which results from keeping hens in large flocks more than offsets the decreased production resulting from this practice. The point at which lower labor cost is met and overbalanced by decrease in production has never been clearly determined, but the general practice among egg producers is to keep fowls of the large breeds, such as Plymouth Rocks, Wyandottes, etc., in flocks of about 100. On large commercial egg farms, where Leghorns are kept, this number often is greatly exceeded, flocks of 500 being common.

To provide sufficient room for 100 hens there should be about 400 square feet of floor space. This requirement is approximately met by the house here illustrated and described, which is 16x24 feet. In its general outlines it meets the requirements of the average poultry keeper to an unusual degree. For houses of moderate size, a width of sixteen feet is almost invariably preferred, and there are sound practical reasons for doing so. A house much narrower than sixteen feet brings the perches too close to the front, and the hens on the perches are exposed to direct currents of air when the curtains are open. Narrow houses cost more to build than those of medium width and are more difficult to care for. On the other hand, extremely wide houses call for heavier framing timbers and more bracing. In long compartment houses a width greater than sixteen feet often is considered desirable, but it is of no advantage in single-pen houses. Even for use on commercial farms where extremely large flocks are the rule, there are many who prefer buildings not over sixteen feet in width. The general plans, with all needed dimensions, etc., are shown in Figs. 60, 61, 62 and 63.

The details of lighting and ventilation in this house are planned to meet the requirements of cold climates, but these can readily be modified to suit a wide range of climatic conditions. Where extreme cold is to be expected, it will be found desirable to reduce the size of the curtains and increase somewhat the amount of glass provided. In warmer climates glass windows will be omitted

FIG. 59—THE HISTORICAL MAINE STATION CURTAIN-FRONT HOUSE

The curtain-front house shown in above illustration was one of the first houses of this type to be built. It has been in successful use at the Maine Experiment Station for many years. Note raised platform in front of the building, which takes the place of an inside passageway.

and the curtains made larger, possibly substituting frameless folding curtains, as shown in Fig. 89, in place of hinged shutters. In the extreme south the curtains also may be dispensed with and the entire front left open.

The estimated capacity of 100 hens is based on a

FIG. 60—FRONT ELEVATION OF CURTAIN-FRONT HOUSE FOR 100 HENS

floor allowance of four square feet per hen. When Leg-horns are kept, and in mild climates where the fowls seldom need to be confined to the house, this number may be increased 25 per cent or more.

Most of the details of construction in this plan, such as building up foundation and floor, window and door framing, rafter cutting, etc., will be found fully illustrated and described in Chapter I, pages 13 to 24, which the builder is urged to read carefully before undertaking the construction of any poultry house, small or large.

A concrete foundation and floor are recommended, as they undoubtedly are most economical in the long run. No special skill is required in doing concrete work, and where the sand and gravel or stone are readily obtainable, it is comparatively inexpensive. Even where professional labor is employed, or the work regularly contracted for, the cost will be repaid in a few years in the saving of labor which will be effected in the daily care of the building, and in the much lower rate of depreciation.

As here planned, this house is framed with single sills and rafter plates; studs and rafters are two feet on centers, and the walls are covered with a good grade of six-inch tongue-and-groove siding. The roof is sheathed with ordinary roofing boards, which should be surfaced on both sides, if such are obtainable without too great additional cost. They may be of No. 2 grade or No. 2 common, as they are to be covered with fairly heavy prepared roofing. No lining or ceiling is provided except about the perches.

Whether to use tongue-and-groove siding, or rough boards to be covered with prepared roofing, is largely a matter of individual preference or necessity. Where rough boards are used, they generally are nailed on up and down, omitting most of the wall studs, as shown on page 17. The omission of studs and the use of cheap siding that could not be utilized without an outside covering, may effect an important saving in cost. If regular grades of lumber are to be bought, however, it will be found that boards covered with roofing will cost more than T & G siding and a house so constructed will depreciate more rapidly, besides being unsightly at all times.

If milled sills for the windows and curtains can not readily be secured, they may be made of ordinary 2x5 or 2x6-inch lumber, setting them to slope outward. Do not use one-inch material here, as is often done. Such sills soon warp and split and must be replaced in a short time

if the building is to be kept in good repair. It is a common error, especially among beginners and those who are doing their own carpenter work, to try to effect petty economies or to do careless, hasty work in connection with these minor details, resulting in defective construction which allows deterioration to set in almost as soon as the building is completed. Like a chain, the poultry house is no stronger than its weakest point, and whether the annual depreciation on it is to be ten per cent, depends upon whether such details as the window sills, for example, have received proper attention.

The boards for the droppings platform are cut to run the short way of the platform and are nailed securely to 2x4-inch stringers, front and rear. The platform is supported in front on 2x4 posts spaced about eight feet apart. These platforms sometimes are made in movable sections so that they can be taken out for cleaning and disinfecting. The advantage of being able to do this is more theoretical than actual, however, and the boards ordinarily are nailed. In fastening them in place, do not drive them up tight together, but leave room for them to swell, as they are certain to do when the house is in use. Where this precaution is neglected the platform will buckle and pull many of the boards loose, necessitating repairs in a short time.

The construction of perches, nests, etc., will readily be understood from the plans shown herewith, but are illustrated and described in detail in Chapter X. If platform nests are preferred instead of wall nests, directions

FIG. 61—FLOOR PLAN OF CURTAIN-FRONT HOUSE FOR 100 HENS

for building them will also be found in that chapter, likewise directions for building trap-nests, and bill of materials needed. Hinged yard doors may be substituted for sliding doors if preferred, hinging them to swing out rather than in, as a rule.

The bill of materials given includes everything nec-

essary to build this house, with a reasonable allowance for shrinkage in the lumber estimates. On the average place, however, there are always a number of uses for good lumber when it is at hand, and it usually happens that boards are taken for various purposes not contemplated in the original plan. It is advisable, therefore, to add a little to net estimates to meet these requirements.

Materials for the concrete foundation and floor are estimated on the basis of a six-inch wall, two and one-half feet from bottom to top. The floor is to be three inches thick, with a four-inch layer of insulating material.

BILL OF MATERIALS FOR HOUSE FOR 100 HENS

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, sides	2x4	12	4	
Sills, ends	2x4	16	2	
Rafter plates	2x4	12	4	
Studs front	2x4	16	6	One piece cuts 2.
Studs, back	2x4	10	8	One piece cuts 2.
Studs, ends and misc.	2x4	16	12	Cut to fit.
Rafters	2x6	18	13	
Stringers for droppings platform	2x4	12	4	
Perches	2x4	12	6	
Sills for windows	2x5	12	1	One piece cuts 2.
Sills for curtains	2x5	12	1	One piece cuts 2.
Roof boards	$\frac{3}{4}$ x10	500	ft. bd. meas.	Sfd. 2 sides
T & G siding	$\frac{5}{8}$ x6	600	ft. bd. meas.	

Flooring for ceiling
droppings platform
and door..... $\frac{3}{4}$ x4 400 ft. bd. meas.
Door frame..... $\frac{3}{4}$ x5 16 lin. ft. Surfaced 4 sides.
Trim lumber..... $\frac{3}{4}$ x4 200 lin. ft. Surfaced 4 sides.
Curtain frame..... $\frac{3}{4}$ x2 $\frac{1}{2}$ 40 lin. ft. Surfaced 4 sides.
Strip under shutter..... $\frac{3}{4}$ x2 $\frac{1}{2}$ 12 lin. ft. Surfaced 4 sides.
Strip under window..... $\frac{3}{4}$ x1 $\frac{1}{2}$ 10 lin. ft. Surfaced 4 sides.
Weather strips for windows & doors..... $\frac{3}{4}$ x $\frac{1}{2}$ 30 lin. ft. Surfaced 4 sides.
5 squares prepared roofing.
6 window sashes, $\frac{1}{4}$ -inch, 6 lights, 8x12-inch glass.
80 sq. ft. 1-inch mesh poultry netting for curtains and windows.
30 sq. ft. heavy unbleached muslin for curtains.
6 anchor bolts, $\frac{1}{2}$ x12 inches, with 2 in. washers for each.
1 pr. T-strap hinges for outside door.
1 hasp for outside door.
2 pr. 2 $\frac{1}{2}$ -inch butt hinges for shutters.
3 pr. 2-inch butt hinges for windows.
2 pr. 3-inch strap hinges for rear ventilators.
2 pr. 4-inch strap hinges for perches.
10 2-inch screw hooks and eyes.
6 ft. chain for sash holders.
1 box 4-oz. carpet tacks for curtains.
1 lb. double-pointed tacks for netting.
Nails and paint.

MATERIAL FOR FOUNDATION AND FLOOR

57 bags Portland cement.
140 cu. ft. sand.
250 cu. ft. crushed stone or gravel.
140 cu. ft. cinders or stone for insulation.

MATERIAL FOR WALL NESTS—3 SETS

(See Chapter X)

Top boards	$\frac{3}{4}$ x10 inches	30 lin. ft.
Back boards	$\frac{3}{4}$ x10 inches	50 lin. ft.
Sides	$\frac{3}{4}$ x7 inches	40 lin. ft.
Bottoms	$\frac{3}{4}$ x8 inches	30 lin. ft.
Running boards	$\frac{3}{4}$ x6 inches	30 lin. ft.

FIG. 62—CROSS SECTION OF HOUSE FOR 100 HENS

FIG. 63—END ELEVATION OF 100-HEN HOUSE

Partitions	$\frac{3}{4}$ x7 inches	25 lin. ft.
Front boards, bottom	$\frac{3}{4}$ x4 inches	30 lin. ft.
Front boards, top	$\frac{3}{4}$ x2 inches	30 lin. ft.
Support for running boards	$\frac{3}{4}$ x4 inches	25 lin. ft.
Strips	$\frac{3}{4}$ x $\frac{1}{2}$ inches	25 lin. ft.

All boards to be surfaced two sides.
6 pr. 1-inch butt hinges.
12 2-inch screw hooks and eyes.

MATERIAL FOR PLATFORM NESTS

If platform nests are preferred instead of wall nests, the following material will be required for 4 sets of five nests each:

Use	Size inches	Length Feet	No. of Pieces
Door	$\frac{3}{4}$ x7	12	2
Front strip	$\frac{3}{4}$ x6	12	2
Bottom	$\frac{3}{4}$ x12	12	2
Rear strip, bottom	$\frac{3}{4}$ x4	12	2
Top strips	$\frac{3}{4}$ x2	12	4
Partitions	$\frac{3}{4}$ x11	10	3
Running board	$\frac{3}{4}$ x6	12	2
Brackets	$\frac{3}{4}$ x4	8	5

All boards to be surfaced two sides.
4 pr. 2 $\frac{1}{2}$ -inch T-strap hinges.
For bill of materials for trap-nests see Chapter X.

Building Temporary Houses

The poultry keeper who has only a limited amount to invest in his poultry house often finds it necessary to omit some features that otherwise would be considered desirable and important. Where this is necessary the plan just given can be reduced to simpler terms, and still cheaper construction provided for. If this is done it must not be expected that the house will prove as convenient or as permanent as a more expensive house, but it may still be made comfortable for the fowls.

One of the first steps in reducing cost is to provide a post foundation and dirt floor. The foundation may consist of posts of some durable material such as cedar, locust, or chestnut. These should be 3 feet long and set 8 feet apart with about 6 inches projecting above the ground. The sills are to be spiked directly to the face of the posts with top of sill 2 inches above top of post and the enclosed space filled in with earth or sand to the top of the sill. If at all possible, it is recommended that a concrete or stone foundation be provided instead of posts, as wooden sills cannot be expected to last more than a few years when in direct contact with the ground, and it is a difficult and expensive operation to replace them.

Plain boards of cheap grade may be used for siding, nailing them up and down as shown in Fig. 19 on page 17, which does away with the necessity for studs except at the corners, middle of each

end and at 6-foot intervals on the sides—enough simply to stiffen the frame and give something substantial to which to nail plates and stringers. The ceiling around the perches may be omitted, also the droppings platform. Instead of the latter set up a 10-inch board

FIG. 64—CROSS SECTION OF COMPARTMENT LAYING HOUSE FOR COMMERCIAL FLOCKS

on the floor, about 12 inches in front of the first perch and extending the entire length of the house. This will confine the droppings under the perches and keep them out of the litter. For nests, orange boxes may be used (see Chapter X), fastening them to the wall by means of screw hooks or pieces of wire bent over nails so that they may be readily removed for cleaning. Perches may be arranged as in Fig. 64 or supported on trestles or on wires attached to the rafters.

These modifications in the regular plan will materially reduce the first cost of the house, but it would not be fair to hold out the impression that such a building will prove as satisfactory in everyday use as a house constructed after the regular plans. The beginner can safely depend upon it that, where experienced poultry keepers are practically unanimous in the adoption of certain details of poultry house construction, there is a thoroughly good reason for doing so.

The following bill of material provides everything needed for constructing a 16x24-foot house where this style of construction is to be followed:

BILL OF MATERIALS

Use	Size Inches	Length Feet	No. Pieces	Remarks
Sills, side	2x8	12	4	
Sills, ends	2x8	16	2	
Plates	2x4	12	4	
Studs, front	2x4	16	6	One piece cuts 2
Studs, back	2x4	10	2	One piece cuts 2
Studs, ends	2x4	8	3	
Stringers and misc.	2x4	10	8	
Rafters	2x6	18	13	
Sheathing boards for roof and sides	1x10	1050	feet, bd. meas.	
Door battens, braces, etc.	1x4	25	lineal feet.	
Sills for windows and curtains	2x3	20	lineal feet.	
Frame for shutters	1x2	45	lineal feet.	
10 squares of prepared roofing.				
6 window sashes, 1¼-inch, 6-light, 8x12-inch glass.				
80 sq. ft. 1-inch mesh netting for openings.				
1 pr. 8-inch T-strap hinges for outside door.				
1 safety hasp.				
5 pr. 2-inch butt hinges for windows and shutters.				
6 pr. 4-inch strap hinges for perch supports.				
20 2-inch hooks and eyes.				
Nails and tacks.

FIG. 65—PART OF FRONT ELEVATION OF COMPARTMENT HOUSE FOR COMMERCIAL LAYING FLOCKS

A SIX-COMPARTMENT LAYING HOUSE

Designed for Use of Commercial Poultry Keepers. It Looks Well, and the Low Front Makes it Extra Comfortable in Winter.

This house is designed to meet the requirements of those who are keeping fowls on a large scale and who want a complete and practical house capable of being extended to any desired length. While the house as here described consists of six pens, having an average capacity of 100 hens each, the number of pens may be reduced or increased to meet individual needs. If Leghorns are kept and large flocks are wanted, the wire partitions and base boards may be omitted.

In long houses unbroken by partitions, especially houses with open fronts, there are always liable to be air currents, and it is chiefly for the purpose of protecting the fowls from drafts that tight partitions are provided at the back of the pens where the perches are located. This is the principal reason, also, for making the front partitions solid to a height of two or more feet. If it is desired to throw several pens into one, the rear partitions should be retained and extended two or three feet farther forward into the pens. In addition to breaking up floor drafts, they divide the house into smaller sections, giving the fowls at least a little feeling of privacy, which they greatly enjoy.

The combination roof indicated for this house is recommended regularly for all laying houses over sixteen feet in width. Shed roofs are sometimes used on twenty-

FIG. 66—END ELEVATION OF COMPARTMENT LAYING HOUSE FOR COMMERCIAL FLOCK

foot houses, but they offer no advantages other than that they are a little easier for the inexperienced builder to construct and, as they make the front considerably higher, they give opportunity for additional ventilator openings up under the front rafter plate. This extra height is an advantage in warm climates and a disadvantage where the winters are cold.

A combination roof may be built with supporting posts, as shown in this plan, using rafter ties only at partitions, or the supporting posts may be omitted and ties used on each pair of rafters. The builder may take his choice of methods, but it is well to remember that when Leghorns are kept in houses with tied rafters it is neces-

sary to enclose the space between each tie and the pair of rafters above it with netting or strips, in order to prevent the fowls from roosting there instead of on the regular perches.

Fig. 67 shows the floor plan for a complete section or pen and a portion of the opposite end section. All sections are made identical with the one shown. Perches are provided as shown in Fig. 67. For detail drawing showing rear ventilator (not indicated in Fig. 64), see Chapter X. This ventilator will be found a great aid in keeping the house comfortable in summer and should never be omitted. It does not seem to be commonly understood that fowls suffer as much from extreme heat as from cold, and their productiveness is affected by either. It is almost as important, therefore, to protect the fowls from severe heat as from cold. The average laying house is unnecessarily hot and uncomfortable in the summer

While not provided for in the plans or the bill of materials, it is recommended that two six-light windows be supplied for each pen, to be located in the rear wall under the droppings platform. These windows are especially desirable in twenty-foot houses, as they light up what otherwise is a comparatively dark section of the floor. In the summer, with the sash removed, the openings will be found to assist greatly in keeping the house cool. Of course, there must be no open cracks about these windows in winter, to expose the hens to drafts.

Fig. 64 shows a cross-section at partition. In exposed locations it may be necessary to build every other partition solid in order to prevent floor drafts, but, as a rule, the two-foot baseboard will protect the fowls sufficiently, and open partitions make the house much cooler in summer. Fig. 66 shows an elevation with slope of roof and location of outside door.

FIG. 67—FLOOR PLAN OF COMPARTMENT LAYING HOUSE FOR COMMERCIAL FLOCKS

simply because provision is not made for sufficient ventilation. As a result of this there is little circulation of air, especially in the back part where perches are located.

With an opening under the eave six to twelve inches wide, depending on where the house is located, there will be a constant circulation of air from front to back or back to front, as the case may be, and the ceiling around the perches will protect the fowls from direct drafts. In some instances a narrow door running the entire length of each pen is placed in the inside wall at the angle where it joins the roof ceiling. This is to be opened in hot weather, thus securing direct air circulation in the roosting compartment. If this is done, the doors must be made to fit tight, as there should be no suspicion of a draft here in winter.

The outside opening should run the entire length of the building and is provided with hinged doors not over six feet long. Use sound, well-seasoned boards for this purpose in order to reduce the tendency to warp. The doors are to be held open with screw hooks and eyes, but should be closed in cold weather and fastened securely in place with wooden buttons.

Fig. 65 shows front elevation and is self-explanatory. The size of the muslin-covered openings may be increased or decreased as local conditions require, remembering, however, that with the shutters closed the fowls will go through extremely cold weather without suffering any injury, even though the surface to be so protected may seem quite large.

The accompanying bill of materials gives everything that is required for the construction of this house as described. In estimating quantities needed, reasonable allowance has been made for waste. Estimates on siding and ceiling provide for 25 per cent shrinkage and on sheathing boards about 10 per cent. However, as there often are changes to be made to meet individual requirements, and as some of the building material is almost invariably taken for other purposes, it will be wise to order a little extra. This is particularly true in the case of $7/8 \times 4$ -inch trim boards for which the poultryman usually finds an astonishing number of extra uses.

Material for the concrete foundation and floor is estimated on the basis of a $2\frac{1}{2}$ -foot wall, six inches thick; floor, three inches thick, and a four-inch insulating layer.

BILL OF MATERIALS FOR 6-PEN COMPARTMENT HOUSE

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, side	2x4	10	48	
Sills, ends	2x4	10	8	
Plates	2x4	10	48	
Studs, front	2x4	10	18	One piece cuts 2.
Studs, back	2x4	10	30	One piece cuts 2.
Studs, ends	2x4	16	11	Cut to fit.
Studs, partitions	2x4	10	30	
Miscellaneous	2x4	10	15	
Partitions, sills	2x4	10	10	
Rafters, rear	2x6	14	61	
Rafters, front	2x6	14	31	
Ridge pole	1x6	10	12	
Center posts	4x4	10	6	
Stringers for drop- pings platform	2x4	10	24	
Perches	2x4	10	36	Surfaced upper edges rounded.
Sills for windows	2x5	12	6	Milled.
Sills for curtains	2x5	12	6	Milled.
Roof boards	3/4x10	3000	ft.	Surfaced 2 sides.
T & G siding	3/8x6	1500	ft.	
Matched flooring for partitions, ceiling and doors	3/4x4	2100	ft.	
Trim lumber	3/4x4	400	lin. ft.	Surfaced 4 sides.
Door frames	3/4x6	36	lin. ft.	Surfaced 4 sides.
Partition doors, braces, etc.	3/4x4	150	lin. ft.	Surfaced 4 sides.
Cross pcs. for perches	3/4x4	100	lin. ft.	Surfaced 4 sides.
Frames for shutters	3/4x2	235	lin. ft.	Surfaced 4 sides.
Strips under shutters	3/4x2 1/2	65	lin. ft.	Surfaced 4 sides.
Inside window sills	3/4x1 1/4	40	lin. ft.	Surfaced 4 sides.
Weather strips for windows & doors	3/4x3/8	120	lin. ft.	Surfaced 4 sides.

MATERIALS FOR PLATFORM NESTS (TWENTY-FOUR SETS, 4 NESTS EACH)

Use	Size Inches	Length Feet	No. of Pieces
Base boards, front	3/4x6	10	12
Doors	3/4x7	10	12
Partitions	3/4x11	12	12
Base boards, back	3/4x4	10	12
Top strips	3/4x2	10	24
Bottom boards	3/4x12	10	12
Running boards	3/4x8	10	12
Brackets	3/4x4	10	12

All boards surfaced four sides.

- 24 4-inch strap hinges for doors.
- 28 squares prepared roofing.
- 24 window sashes, 1 1/4-inch, 6-light, 10x14-inch glass.
- 850 sq. ft. 1-in. mesh netting for partitions and windows.
- 225 sq. ft. muslin for curtains.
- 26 anchor bolts, 1/2x12-inch, with 2-inch washers for each.
- 2 pr. 8-inch T-strap hinges for outside doors.
- 2 6-inch hasps for doors.
- 12 pr. 2-inch butt hinges for windows.
- 12 pr. 2 1/2-inch butt hinges for shutters.
- 6 doz. 2-inch hooks and eyes.
- 12 pr. 4-inch strap hinges for perch supports.

FIG. 68—PLANS FOR CONSTRUCTING NEW ENGLAND LAYING HOUSE
Prepared by Poultry Dept. Mass. Agri. College.

- 5 pr. double-acting spring hinges for partition doors.
- 12 pr. 4-inch strap hinges for ventilator doors.
- 36 ft. chain for sash holders.
- Nails, tacks and paint.

MATERIAL FOR FOUNDATION AND FLOOR

- 210 bags Portland cement.
- 500 cu. ft. sand.
- 950 cu. ft. crushed stone or gravel.
- 800 cu. ft. cinders or broken stone for filling.

FIG. 69—NEW ENGLAND OPEN-FRONT LAYING HOUSE
Photo from Mass. Agri. College.

A NEW ENGLAND LAYING HOUSE

Especially Suitable for Farm Flocks. Has Open Front and Separate Small Pen Suitable for Breed-ers or Storage.

By PROF. J. C. GRAHAM

The plan herewith presented shows a detention pen six feet wide on the east side of the house. As can be seen, the house is 18 feet deep and 24 feet long, which gives floor space sufficient for 100 pullets or hens.

The height of the front is 7 feet 10 inches, and back, 4 feet 10 inches. A 2x4, 12 feet long, sawed in two, will make the back stud 4 1/2 feet and the front 7 1/2 feet. Then the two-inch plate at the top and the sill at the bottom

give the full dimensions already stated. The rear rafter is just 14 feet long, the front one six feet, and the peak 10 feet from the floor. Note that the rafter at the rear is sawed off flush with the back edge of the stud and plate, and the rear roof board is allowed to project over about three inches, with a small strip nailed up underneath it on the outside. This closes up the crack, if any, and makes a tight, cheap method of construction. The front ends of the rafters are sawed off vertically, and underneath the projection of the rafters a board is fitted in between the board nailed against the ends and the siding end of the house, which gives a tight, cheap construction for the front end of the rafters. Note that a 4x4 beam supports the center of the roof. This is necessary in a house 18 feet wide.

The cloth at each end of the opening is nailed to frame made of material three inches wide and

FIG. 70—FRONT ELEVATION, CORNELL MODEL POULTRY HOUSE

seven-eighths in. thick. These are not hinged, but are kept in place by buttons on the inside. We think this is a little better than hinging, because curtains hinged at the top gather an immense amount of dust while the curtain is hooked up near the ceiling. These cloth frames can be removed in the summer time, but in cold weather they should be kept in place at all times. The rest of the opening, 10x3 feet, is covered by inch-mesh wire. There is no cloth or further protection. The birds roosting so far from the opening will not suffer in cold weather when the house is sufficiently filled.

The reason for placing the opening in the center of the house, as we have done, is because an opening placed in that position, and not more than 19 feet in length, does not admit the wind sufficiently to give it a chance to whirl about in the house, whereas, if the wire and cloth portions of the front are reversed, the wind will whip in at one end and out of the other and the birds will be in a constant draft if there is any movement of air.

The back part of the house is ceiled with ceil board from the plate down to the droppings board, and a ventilator at the back of the house is so arranged that the air during the summer months can pass in at the front of the house, under the droppings boards, up between this lining and the boards on the outside, and out, cooling the house to quite an extent without subjecting the birds to drafts. These ventilators should be left open during the summer months.

The boards used on the outside are novelty siding, with no paper. This gives a very sightly house, and is also cheaper than one made of rough boards and covered with paper, unless one has the boards on hand.

It is more economical to use 2x4's for rafters, and if sound they are heavy enough to support the roof. The house can be built with a shed roof if one desires, as there will be plenty of head room. Twenty-foot rafters are required for such a roof.

This house is designed for a single pen or a section of a long house. We made it 30 feet long.

THE CORNELL MODEL POULTRY HOUSE

The Latest Cornell Laying House. Equipped With Dust Bath, Wind Baffles, and Coops for Broody Hens. Special Ventilator.

By PROF. JAMES E. RICE

This house, as here illustrated, is provided with a concrete floor. If desired it may be set up on posts about a foot above the ground and a board floor put in. Quite frequently a board floor can be put in at considerably less cost than a concrete floor and may prove nearly as satisfactory. However, on the farm we advise that the concrete floor be used. The stones, gravel and sand are usually near at hand and by using farm help the concrete foundation and floor can be put in at little expense. The concrete floor, if properly built, is warmer in winter and will outlast the board floor.

FIG. 71—FLOOR PLAN OF CORNELL MODEL POULTRY HOUSE

with a partition six feet from the east end, giving us a detention pen 6x18 feet. Every poultryman should have an extra pen of this kind. It may serve as a hospital in the fall, if necessary, or a pen for fattening cockerels or surplus females. It makes a fine place for a breeding pen during that time of the year, or for sitting hens during the hatching season. Many no doubt will prefer to install suitable bins so that this space may be utilized as a feed room which may be done to good advantage if floor is rat-proof.

FIG. 72—CROSS SECTION OF CORNELL MODEL POULTRY HOUSE

FIG. 73—CROSS SECTION OF FRONT

After the floor is made ready the studding and plates for front and rear are next cut and put up, squared and braced. The studs in front are cut nine feet long and those in the rear are 5 feet long. Notches for the 1x6-inch ribbon should be cut in the rear studs before they are put up. The rafters should be notched to fit onto the plates and they should also set on top of the studding front and rear. If preferred, short rafters, 2x6-inch, 12 feet long may be used and allowed to overlap in the center and spiked together. The 2x6-inch roof support should now be put in with a 4x4-inch post in the center and a 2x4-inch under each end. Raise this support a little so as to make the rafters slightly crowning in the center. Space the end studs from two and one-half to three feet apart.

In most localities in this state a single thickness of cove or novelty siding is all that is required. This siding must be put on with considerable care. A knot hole or a crack

between the boards may be the means of creating a draft in the house that will cause many birds to become ill with colds. Cove siding must be thoroughly dry when it is put on, otherwise cracks are likely to open up between the boards when wind and sun have dried them out. Spruce siding is the best because it will not shrink as much as pine. The advantage in using the cove siding is that it can be painted so as to make a very attractive house.

The Cornell wind haffler was designed for the purpose of taking the place of the muslin curtains for ventilation. See page 21 for directions for making and installing bafflers.

The perches are hung with hooks and chains to help prevent the mites from getting onto them. The perches should be painted twice a year with a good creosote wood preserva-

tive. This will also help to keep the mites away.

In the ceiling, about three inches above the droppings board, a four-inch opening extending the full length of the house is made. The object of this opening is to provide a means for carrying off the bad odor from the droppings boards and roosting compartment. If desired, this opening may be closed in the wintertime. The ten-inch opening under the eaves in the rear is almost a necessity during hot weather. This opening extends the full length of the house and there are four doors that can be opened and closed as desired, made of boards 12 inches wide. These should be cleated to prevent them from warping. The front ventilators are usually kept open all summer and should be opened a little in cold weather if there is any indication of dampness in the house. The window sashes are arranged to drop back at the top in order to increase ventilation. This feature is especially valuable during the winter months.

The bottoms of the nests are stationary, but the frames are removable for easy cleaning and spraying. If desired, these nests may be made much lighter by making the frames entirely of 9-16-inch lumber. There is an opening for the hens to enter the nests at the end nearest the droppings boards. A board or a small gate should be arranged to close this opening whenever it may be necessary to prevent pullets or hens from getting into the nests at night. A droppings board is placed just above the nests and a frame covered with one-inch mesh poultry wire above this for the bottom of the broody coop. The broody coop may be divided into two parts by a partition in the center. Troughs for feed and water can be hung on the outside of the slats.

A 14-foot partition is put in the center of the house. This partition makes the house more rigid and also serves to prevent the circulation of strong air currents. This partition makes it convenient at the breeding season for dividing the house into two pens, one of which can be used for the selected breeders. The mash hopper should

FIG. 74—MISSOURI POULTRY HOUSE, SHOWING FRONT AND SIDE
Photo from University of Missouri.

be about six feet long and is built into the partition where it is least in the way of the caretaker.

We consider the outside dust wallow a great improvement over the old style indoor dust box. It has the advantage of being outside, out of the way. It gives additional floor space at little cost. It receives the sunlight from three sides and very little dust can get into the house. The dust wallow should have a concrete floor which is on a level with that of the house. The roof is made on a frame so that it can be lifted off by two men for convenience in renewing the supply of fine sand, which seems to be the most satisfactory material for this purpose.

There will be little necessity for laboriously handling fowls and dusting or otherwise treating them for lice.

THE MISSOURI POULTRY HOUSE

Is Proving Quite Popular in the Middle West, Particularly On Farms. Is Lighted On All Sides and Has Straw Loft.

By PROF. H. L. KEMPSTER*

The Missouri Poultry House has been designed by the Poultry Department of the University of Missouri, College of Agriculture, to meet the demand for a house of such size as to accommodate the average Missouri farm flock and also be adapted to Missouri conditions.

Since the average farm poultry flock in Missouri is from 100 to 150 hens, this house is 20 feet square, the square house being the most economical to construct and affording a maximum amount of floor space. The ridge of the roof runs north and south, the roof being of equal spans. The walls are five feet at the eaves. It is eleven feet high at the peak. The south side contains a door in

FIG. 76—CROSS SECTION OF MISSOURI OPEN-FRONT POULTRY HOUSE
Reproduced from Bul. 80, University of Missouri.

the center and a window 2x3 feet on each side of the door. These windows are placed high enough to afford a 30-inch opening beneath, one foot above the floor and extending the entire length each side of the door. This opening is covered with wire screen, which keeps the hens in and the sparrows out.

On the east and west sides are two windows, each two feet high and three feet wide. On the north end next to the floor is a six-light 8x10-inch glass window. An arrangement which admits light from all directions has decided advantages, because the light is so distributed that there are no dark corners, thus discouraging the laying of eggs on the floor. Also, when light comes from one direction the hen always faces in that direction when she scratches. In consequence, there is a gradual movement of the litter toward the back side of the house. When light is evenly distributed this trouble is eliminated. One hen scratches in one direction and another in another and the litter never piles up on the dark side, because there is no dark side in such a house.

Another decided advantage in having openings on all sides is the excellent summer ventilation which can be afforded by removing the windows. This is an important point and should not be overlooked in constructing a house under Missouri conditions. Summer ventilation is as important as winter ventilation.

During the winter the success of ventilation of this type depends upon having the east, west and north sides and the roof entirely air-tight, so that wind will drive into the house only a short distance and never back to the roosts, which are on the north side. There is a gradual movement of the air from the inside out, thus insuring an abundance of ventilation without drafts. Open-front ventilation has an advantage over all other ventilation because it requires no adjusting, never plugs up, and always works. This type of ventilation will adapt itself to temperature changes without the constant attention of the attendant and in this way reduces to a minimum the labor of caring for the house. It probably meets the requirements of a simple efficient farm poultry house more nearly than any house that has been previously designed. The walls are of car siding, running up and down which forms a tight and attractive wall. The roof is made up of ship-lap covered with shingles.

FIG. 75—FLOOR PLAN OF MISSOURI OPEN-FRONT POULTRY HOUSE
Reproduced from Bul. 80, University of Missouri.

The floor is made of dirt, which is an economical and durable type. Dirt floors are very efficient if properly constructed. In constructing a dirt floor there should be a wall six to eight inches high. A fill of four inches of coarse material, such as cinders, should be made to prevent damp floors. On top of the tamped cinders should be placed two or three inches of damp clay, which should be packed well and then permitted to dry so that it will harden. On top of the clay should be placed half an inch of loose dirt. The clay prevents the dirt and straw from mixing with the cinders to such an extent as to cause the moisture to rise. A covering of a foot or more of straw will keep the floor dry at all times.

The greatest objections to dirt floors are: (1) the possible invasion of rats; (2) the fact that the straw will become dirty quicker than with a concrete floor; and (3) dustiness, which in many

FIG. 77—END ELEVATION OF COLD CLIMATE HOUSE

cases has caused throat trouble. However, because of the low cost of construction, the dirt floor can be safely recommended and it will prove very efficient.

The roosts should be at the back or north side and all on the same level. They should be four feet above the floor, 14 inches from the wall, and 12 inches apart, and made of 2x4's with rounded corners. Poles two inches in diameter, if firmly placed, will serve the purpose nearly as well. Eight inches beneath the roosts is placed the droppings platform, which keeps the floor clean and increases the floor space available for other purposes. Underneath the droppings platform are placed the nests. There should be eight inches of roosting place for each bird and one nest for every six or seven hens.

Joists or collar beams are placed in the house just high enough to afford head room. In order to prevent the birds from roosting on these, they are covered with inch boards, 4 inches wide, placed two

FIG. 78—FRONT ELEVATION OF MISSOURI POULTRY HOUSE

Reproduced from Bul. 80, University of Missouri.

inches apart. This forms a loft which is filled with straw. The straw acts as a sort of sponge by absorbing both dampness and heat and helps to keep the house drier in the winter and cooler in the summer.

In most sections it will probably cost about \$120.00 to build this house, aside from the painting. It will accommodate from 120 to 175 hens, depending in part on the breed, making the cost about \$1.00 per hen or a little less. Plans for constructing this house are shown in Figs. 75, 76 and 78, and the complete house in Fig. 74.

BILL OF MATERIALS

Use	Pieces	Size	Bd. Feet
Rafters	22	2x4-12	176
Plates and sills	8	2x4-20	107
Studding and frames	1	2x4-10	7
Roosts	5	2x4-20	74
Finishing	6	1x4-10	20
Finishing	1	1x4-16	6
Finishing	4	1x4-10	14
Finishing	8	1x4-12	32
Floor for loft	52	1x4-14	260
Car siding for walls	—	1x6-10	600
Shiplap for roof and drop. plat.	—	1x8-12	720

Shingles—5½ M.

Sashes—7 6-light, 8x10-inch glass.

Wire netting for windows and front—3x32.

Hinges—1 pair.

Foundation—3 cu. ft. of concrete.

* From Missouri Experiment Station Circular 80.

FIG. 79—CROSS SECTION OF COLD CLIMATE HOUSE

CHAPTER IV

Laying Houses to Meet Special Conditions

Laying Houses Especially Designed to Meet the Requirements of Cold and Warm Climates—Houses With Open-Front and Semi-Monitor Roofs—Block and Concrete Houses—Numerous Houses Designed to Meet Special Conditions, That Are in Everyday Use by Practical Poultry Keepers in This Country and Canada.

UNIFORMITY in poultry-house design, as has been stated elsewhere in this book, is highly desirable so far as it can be attained without sacrificing convenience or efficiency. What may be called the "general-purpose" types, illustrated and described in the preceding chapter, probably will meet the requirements of the great majority of poultry keepers without

matter of fact, nothing but the high cost of building this house stands in the way of its general adoption in all sections of the country. The thick blanket of straw in the gable not only makes the pen warmer in winter, but keeps it cooler in summer. It also absorbs moisture and keeps the house dry. There is a marked increase in interest in straw-loft houses where extreme cold must be encountered. Aside from the gable roof, straw-filled loft, and double walls, this house does not differ materially from the one described on pages 35 to 37, and all that is said there in regard to the foundation, floors and fixtures applies with equal force to this house. It is especially desirable to have a concrete foundation and floor with double-walled houses, as the space between the walls makes an excellent hiding place for rats. When once they have obtained a foothold it is entirely difficult to dislodge them, and even more so if they gain access to straw loft.

In finishing the loft it is wise to provide a trap door in the ceiling so that the straw can be thrown down

into the house instead of having to fork it all out at the gable doors. This trap need only consist of a few slats with a batten at each end, cutting these long enough to reach across to the permanent slats on either side, which will hold the door in place without hinges or other fastenings.

In filling the loft, which usually will be done in the fall, use good, clean straw, free from mold, dust, or chaff. Chaffy straw will pack too tight, interfering with ventilation. The material should be filled in loosely, almost to the ridge, starting at the farther end and working back without tramping. Filled in this way the material will settle just enough to leave a good-sized open space below the ridge, which is essential to proper circulation of air.

Fig. 79 shows a cross-section of the house with wall nests, perches, etc. The slats that are to hold the straw in place should be nailed securely to the underside of the overhead joists and may be spaced quite a bit further apart than shown in the plan if it is desired to economize

FIG. 80—FRONT VIEW ELEVATION OF COLD CLIMATE HOUSE

change or modification in any essential particular. There are, however, special conditions, due to climate, location, or the use to which the house is to be put, that make it more practical to adopt some special type of construction than to adhere to a standard plan, regardless of how desirable it may be to do so, in a general way. Each individual must decide for himself what is required in his particular case. In the following pages will be found plans for a number of houses designed to meet unusual conditions and requirements. It must be a very difficult problem, indeed, for which a suitable solution cannot be found among these.

A LAYING HOUSE FOR COLD CLIMATES

Straw-Loft Houses Are Highly Desirable in Extremely Cold Climates. They Are Comfortable, Dry, and Well Ventilated.

What is known as the "straw-loft" house is one of the most desirable of special-type poultry houses. As a

FIG. 81—SECTION OF FRONT ELEVATION OF COMPARTMENT HOUSE FOR WARM CLIMATES

on lumber. Where long straight poles are obtainable these may be used in place of sawed strips. Whether strips or poles are used, it is a good plan to lay a single wide board across the top face of the joists, immediately under the ridge, in order to have secure footing when it is necessary to enter the loft. It will be noted that no rear ventilators are provided in this plan. With a straw loft and with the louvered ventilators on hinges like doors, so that they may be thrown wide open in warm weather, no additional ventilation is needed in the north. The floor plan for this house is the same as the one for curtain-front house described on pages 35 to 37.

Fig. 80 gives the front elevation, with dimensions for windows and curtained openings clearly indicated. Fig. 77 shows end elevation, with location and size of ventilator door in gable.

BILL OF MATERIALS

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, sides	2x4	12	4	
Sills, ends	2x4	16	2	
Plates, sides	2x4	16	3	
Plates, ends	2x4	16	2	
Studs	2x4	14	44	One piece cuts 2.
Studs, gable and miscellaneous	2x4	10	8	
Rafters	2x5	10	26	
Ridge	1x6	12	2	
Ties	2x5	16	11	
Staybraces	1x6	8	11	One piece cuts 2.
Supports for drop-pings platform	2x4	12	4	
Perches	2x4	12	6	48 Round edge.
Sills for curtains	2x8	10	1	12½ Surf. 4 sides.
Sills for windows	2x8	12	1	15 Milled, cuts 2.
Siding	¾x6	730	ft. bd. meas.	Milled, cuts 3.
Roof boards	¾x10	260	ft. bd. meas.	Surfaced 2 sides.
Flooring for ceilg, drop. platform, door, etc.	¾x4	800	ft. bd. meas.	
Trim lumber	¾x4	300	lin. ft.	Surfaced.
Strips for loft	¾x3	800	lin. ft.	Surfaced.
Door and window frames	¾x6	90	lin. ft.	Surfaced.
Strip under shut's	¾x3½	8	lin. ft.	Cuts 3. Surfaced.
Strip base of window	¾x2½	8	lin. ft.	Cuts 3. Surfaced.
Frame for shutters	¾x2	30	lin. ft.	Cuts 3. Surfaced.
Frame & louvering for gable doors	¾x4	50	lin. ft.	Cuts 3. Surfaced.
Weather strips for windows & doors	¾x½	30	lin. ft.	Cuts 2. Surfaced.

6 squares of prepared roofing.
6 window sashes, 1¼-inch, 6-light, 10x12-inch glass.

- 70 sq. ft. 1-inch netting for openings and windows.
- 30 sq. ft. unbleached muslin for curtains.
- 2 4-inch hasps for gable door.
- 6 anchor bolts, ½x12-inch, with 2-inch washers for each.
- 1 pr. 8-inch T-strap hinges for outside door.
- 1 6-inch hasp for outside door.
- 2 pr. 2½-inch butt hinges for shutters.
- 3 pr. 2-inch butt hinges for windows.
- 2 pr. 4-inch T-strap hinges for gable doors.
- 3 pr. 4-inch strap hinges for perch supports.
- 1 ft. chain for sash holders.
- 10 2-inch screw hooks and eyes for windows, etc.
- Nails, tacks, and paint.

MATERIALS FOR FOUNDATION AND FLOOR

- 57 sacks Portland cement.
- 140 cu. ft. of sand.
- 200 cu. ft. of crushed stone or gravel.
- 140 cu. ft. of cinders or stone for filling.

MATERIALS FOR WALL NESTS

Use	Size Inches	Length Feet
Top	¾x10	30 lin. ft.
Back	¾x10	55 lin. ft.
Sides	¾x7	40 lin. ft.
Bottoms	¾x8	30 lin. ft.
Bottoms	¾x7	30 lin. ft.
Foot boards	¾x6	30 lin. ft.
Partitions	¾x7	25 lin. ft.
Front boards, bottom	¾x4	30 lin. ft.
Front boards, top	¾x2	30 lin. ft.
Support for running boards	¾x4	25 lin. ft.
Strips for partitions	¾x½	25 lin. ft.

All boards surfaced 2 sides.

- 6 pr. 1-inch butt hinges.
- 12 2-inch screw hooks and eyes.

MATERIALS FOR PLATFORM NESTS

If platform nests are preferred instead of wall nests the following material will be required for four sets, five nests each:

Use	Size Inches	Length Feet	No. of Pieces
Doors	¾x7	12	2
Front base	¾x6	12	2
Bottom	¾x12	12	2
Rear base	¾x4	12	2
Top strips	¾x2	12	4
Partitions	¾x11	10	3
Running boards	¾x6	12	6
Brackets	¾x4	8	5

All boards surfaced 2 sides.
4 pr. of 2½-inch T-strap hinges.

The various details of construction which apply generally to this and all similar houses, will be found in Chapter I, under appropriate headings. While the bill of materials specifies prepared roofing, good shingles, if obtainable at reasonable cost, will be found more satisfactory and will last longer.

FIG. 82—FLOOR PLAN OF COMPARTMENT LAYING HOUSE FOR WARM CLIMATES

FIG. 83—FRAMING THE FRONT OF WARM CLIMATE HOUSE

A LAYING HOUSE FOR WARM CLIMATES

Provides Extra Ventilation Required in All Warm Climates. Is Not Too Deep, and Front is Shaded By Wide Eave.

While the house described on pages 38 to 40 may be adapted to the requirements of warm climates by making suitable changes in ventilation, there are some features that are especially desirable in mild climates that are not needed or wanted elsewhere. For this reason plans for a special warm-climate house have been prepared. This house can be built in any number of pens desired, the one here illustrated affording ample accommodations for 900 to 1000 fowls, or about 150 to the pen. The rule of four square feet to the fowl, which applies generally wherever fowls must be kept in confinement for long periods of time, does not hold where they can be out most of the time and where the house is mainly a place for roosting and for providing accommodations for nests, feed hoppers, etc.

The foundation and floor as shown in the cross-section, Fig. 85, are of concrete. It will be noted that the foundation wall is carried up a foot above the floor, the purpose of this being to protect the sills from decay and insure a dry floor. It is planned to have the floor a foot above the ground level, but if the site is well drained, six inches will be enough. General details of foundation, floor, and anchorage are as described in Chapter I.

To afford protection from the sun, the front eave is extended so as to form a permanent canopy over the front of the house. Some builders go a step further than this and make the canopy six feet or more wide, enclosing the space and using it as a sort of shaded runway. This is an excellent plan and adds but little to the cost of the house. Where this is to be done it is advisable to provide a plain shed roof over the main part of the house (16 feet) and then extend the canopy as far forward as desired, sloping it to the front. This can be done without changing or interfering in any manner with the plans of the house as here given, except to use 18-foot rafters.

Fig. 82 shows floor plan, with location of all fixtures. The house for which this plan was originally prepared was to be equipped with trapnests as shown. As a smaller number of hens can be accommodated per nest where trap-nests are used, additional nests had to be provided along the wall or partition. The plan for these nests will be found in Chapter X, and a bill of materials given. If ordinary platform nests are to be used, the space

under the platform will accommodate all the nests needed, building them as described in Chapter X.

The difficulty of controlling lice and mites is much greater in warm climates than in the north and it is always advisable to provide lice-proof metal perch supports, as shown. Where these are installed and properly looked after, there is no possibility of mites passing from the perches to the wall and platform, resulting sooner or later in a mite-infested house which can only be cleaned by the most painstaking efforts. Fig. 37 shows the type of rear ventilator in general use in the south. No harm will result from having this open directly into the house, but it is desirable to have the perches sufficiently below the opening so that the fowls on them will not be in a direct draft.

FIG. 84—AN OPEN FRONT HOUSE AT GEORGIA EXPERIMENT STATION

Houses of this general type are in successful use in all parts of the South—generally with muslin curtains for additional winter protection.

The opening for the rear ventilator should be at least 10 inches wide, and should run the entire length of the building. It is enclosed on the inside with one-inch poultry netting. Two six-light window sashes should be placed in the rear wall in each pen, under the droppings platform. These are provided as much for coolness as for light.

Fig. 81 shows the front elevation, with dimensions of openings, which may be protected with muslin curtains on the outside of the building, as shown in Fig. 89, on

FIG. 85—CROSS SECTION OF WARM CLIMATE HOUSE

FIG. 86—END ELEVATION OF WARM CLIMATE HOUSE

page 49. Fig. 83 shows the method of framing the front with all necessary dimensions. Fig. 86 shows method of enclosing the ends, leaving a large ventilator opening in each gable, to be protected with poultry netting.

BILL OF MATERIALS

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, sides	2x4	10	20	
Sills, ends	2x4	16	2	
Plates and stringers	2x4	10	90	
Base of partitions	2x4	10	5	
Studs, front	2x4	14	40	One piece cuts 2.
Studs, back	2x4	10	40	One piece cuts 2.
Studs, ends, part'n's, etc.	2x4	16	25	One piece cuts 2.
Ridge plate	2x4	10	20	
Center posts	4x4	10	12	
Ties	1x6	10	74	
Rafters, front	2x6	16	40	One piece cuts 2.
Rafters, rear	2x6	14	73	
Support for drop. plat.	2x4	10	30	
Perches	2x4	12	36	
Sills for front open's	2x6	10	20	One piece cuts 2.
T & G siding	1x6	2000 ft. bd.	meas.	Surfaced.
Roof boards	1x10	3500 ft. bd.	meas.	Surfaced.
(If galvanized roofing is used substitute 1400 s. f. 1x4 strips.)				
Flooring bds. for plat'ns, doors, partitions, etc.	1x4	1900 ft. bd.	meas.	
Trim lumber	1x4	1600 ft. bd.	meas.	Sfd. 4 Sds.
Door frame	1x5	400 lin. ft.		Surfaced 4 sides.
T & G boards for hop's	1x6	800 sq. ft.		

32 squares prepared roofing or galvanized roofing.
 1200 s. f. of 1-inch wire netting for front, partitions, etc.
 20 anchor bolts, $\frac{1}{2}$ x12-inch, with 2 2-in. washers for each.
 2 pr. 8-inch T-strap hinges for outside doors.
 5 pr. double-acting springs hinges for partition doors.
 12 pr. 6-inch strap hinges for rear ventilating doors.
 2 dozen 2-inch hooks and eyes.
 12 pr. 4-inch strap hinges for perch supports; or 36 pairs metal perch supports.
 Nails, staples and paint.

MATERIALS FOR TRAP NESTS

(See Chap. X.)

Sides and bottoms, T & G boards	$\frac{3}{4}$ x4	800 s. f.
Top rail of partitions	$\frac{3}{4}$ x2	160 lin. ft.
Top rail of ends	$\frac{3}{4}$ x1 $\frac{1}{2}$	160 lin. ft.
Bottom rail of ends	$\frac{3}{4}$ x3	160 lin. ft.
Side rail of ends	$\frac{3}{4}$ x2	170 lin. ft.
Strips	$\frac{3}{4}$ x $\frac{1}{2}$	260 lin. ft.
Partition strips	$\frac{3}{4}$ x2 $\frac{1}{2}$	160 lin. ft.

All boards to be surfaced 4 sides.
 Galvanized doors, wire, staples and wooden triggers.

MATERIALS FOR PLATFORM NESTS

(24 sets of 4 nests each. To be substituted for trap-nests if preferred.)

Use	Size Inches	Length Feet	No. of Pieces
Door	$\frac{3}{4}$ x7	10	12
Front base	$\frac{3}{4}$ x6	10	12
Bottom	$\frac{3}{4}$ x12	10	12
Rear base	$\frac{3}{4}$ x4	10	12
Partitions	$\frac{3}{4}$ x11	10	12
Running boards	$\frac{3}{4}$ x6	10	12
Top strips	$\frac{3}{4}$ x2	10	24
Uprights	2x4	10	12
Brackets	1x4	10	24

All boards to be surfaced 4 sides.
 30 pr. 2 $\frac{1}{2}$ -inch T-strap hinges for nest doors.

MATERIALS FOR FOUNDATION AND FLOOR

220 bags Portland cement.
 650 cu. ft. of sand.
 900 cu. ft. of gravel or crushed stone.
 800 cu. ft. of cinders or stone for filling.

BILL OF MATERIALS FOR BOARD FLOOR

If a board floor is preferred for this house instead of concrete, the following lumber will be required:

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Posts, wood, stone or concrete	8x8	5	60	
Sills, sides	2x8	16	40	Doubled.
Sills, ends	2x8	16	4	Doubled.
Bridging	1x2		750	lin. ft.
Joists	2x8	16	75	
T & G flooring			3,000	s. f.

Posts to be spaced 6 feet apart, set 2 feet deep and leveled 3 feet above the surface of the ground. If building is on sloping ground, posts are to be leveled so that sill will be at least 18 inches from the ground at point nearest the ground.
 600 sq. ft. of siding will enclose underpart on three sides, leaving the front open.

OTHER WARM CLIMATE HOUSES**Various Types of Practical Houses in Successful Use in the South.**

The illustrations on this and the following pages show other types of houses that are in successful use in the south, all indicating that protection from enemies and from rain and sun is about the only imperative condition that must be met. No detailed description of these houses need be given, as their construction is of the simplest nature. They are illustrated here simply to show the different methods that may be successfully employed to secure a free circulation of air without which poultry houses in warm climates will prove unendurable for fowls in the hot season.

Fig. 89 shows a house in the Morristown (Tenn.) district. With slight modifications houses of this type will be found all through this section. The muslin curtains are fastened to wires at top and bottom by means of small rings, and slide back and forth to open and close. The curtains are on the outside of the front and high winds simply blow them back against the netting, which supports them so that they do not whip back and forth to any great extent. Because of this freedom from whipping these loose curtains appear to last about as long as muslin tacked to frames.

The house here shown is built with a plain-shed roof and the entire front, from the top plate to within about

FIG. 87—A GOOD HOUSE FOR SEMI-TROPICAL CLIMATE

This house was designed for use in the semi-tropical climate of the extreme southern part of the United States. Maximum air circulation is secured and eaves are made extra wide for shade.

three feet of the ground, is left entirely open except for the curtains. In the comparatively mild climate of Tennessee this construction provides a good degree of winter comfort for the fowls and plenty of ventilation for summer. Throughout the south generally, wide houses

are not considered desirable on account of the difficulty of making them cool in summer, and they seldom are built over 16 feet in depth, unless with a semi-monitor roof. So far as the general details of construction and arrangements are concerned, the house illustrated in Fig.

89 does not differ materially from the six-compartment house shown in Figs. 81 to 86, aside from the fact that low-cost construction as described on page 37, is almost invariably adopted.

Fig. 84 shows a practical laying house on the poultry plant of the Georgia Experiment Station. It is built with a combination roof and a wide eave which shades the front—a highly desirable feature in warm climates. Houses in the south especially need rear ventilators as shown in Fig. 37, providing not only the

door under the eave, but also the windows under the droppings platform. It is just as important to protect fowls from heat here as it is to protect them from cold in the north, and there is no better means of doing this than in the manner just suggested.

Where English sparrows are numerous, it will pay well to use one-half or three-quarter-inch netting on all openings in poultry houses, as the birds can get through ordinary inch-mesh netting. Where the front is open practically all the time, as is the case in the south, these pests become thoroughly at home, multiply rapidly, thanks to the good feeding they are able to secure from the open hoppers, and in the course of a year's time consume great quantities of feed.

The house described on pages 47 and 48 is designed for use in semi-tropical climates, where its free ventilation, combined with the shade afforded by the extra wide eaves, makes it particularly desirable.

Houses of similar wide-open construction can be used to excellent advantage as colony houses for growing stock in all parts of the south. The buildings usually provided for this purpose are almost invariably too close and warm. After settled weather chickens undoubtedly will do much better if given open-air conditions such as are afforded by this house.

As here illustrated it is used for a laying flock, the nests being placed on the outside of the building and attached to it by means of stout hooks. The fowls reach the nests through

suitable doors (seen on the left side), and eggs are gathered from the outside, the top being on hinges. The perches are arranged in two sets located on either side, with a three or four-foot passageway through the center. They are hinged at the side to swing out of the way, and in this illustration are shown hooked up, as they usually are left during the day. Notice that the perches instead of being placed close together as is usually the practice in the north, are spaced wide apart so that the fowls will not be bunched on them at night.

No droppings boards are provided for ordinary use. If a concrete floor is provided every practical requirement is met by covering it with an inch or two of clean sand. For colony use the houses rest directly on the ground and instead of constant cleaning are simply moved to a new location from time to time. The top ventilator affords an outlet for the warm air in the upper part, this method of construction maintaining a constant circulation through the house even when there is no breeze at all. If to be used as a movable house, it will be necessary to brace it well, as there are no boards on the sides to help to stiffen the frame, and it will quickly become racked out of shape unless thoroughly braced at all corners.

For use in the extreme south, where protection from extreme heat is the principal object sought, the house illustrated in Fig. 77, has been found very satisfactory. This house was designed by J. T. Gratigny of Southern Florida and is the result of many years' experience in poultry keeping in that semi-tropical climate. The walls of the house consist exclusively of one-inch mesh netting and are about four feet high at the eaves. The nests are placed on the ground under the eaves and are entered by the hens from the house, while the eggs are gathered from the outside. The particular house here shown is portable and for that reason has no floor. For permanent houses concrete floors are recommended. The perches are placed on horizontal frames located on each side of the house, with a four-foot passageway through the center. Perches are about three feet above the floor and the frames are hinged at back to swing up out of the way when droppings are to be cleaned out.

AN OPEN FRONT LAYING HOUSE

This Type of House is Quite Popular in Sections Where Winters Are Not Too Severe. Front is Always Open.

The house shown in Figs. 90 and 91 represents one method of open-front construction. No curtains of any sort are provided for this house as regularly planned, the

FIG. 89—LARGE LAYING HOUSE IN MORRISTOWN (TENN.) DISTRICT

Curtains usually are closed only in extremely cold weather but, as in the case with the house illustrated above, they may be partially drawn in warm weather to provide shade.

FIG. 90—A POPULAR OPEN-FRONT HOUSE

low front and shape of roof being depended upon to keep rain and snow from beating in. For a small house, where the owner wishes to be free from the necessity of adjusting curtains to meet changing weather conditions, and with small-combed fowls, this plan gives good results. It is being used successfully even in comparatively cold climates. The following description of this house is by the originator, Jos. Tolman:

"This fresh-air house is a very simple one to construct, as will be seen by noting the photographic view and plans. It is a plain hip-roofed building with the long pitch of the roof to the front or south. The roof and closed sides are of one-inch boards, shingled, making tight walls and roof. The eaves are about four feet from the ground and the peak of the roof is a little over seven feet. The house is eight feet wide by 14 feet long, and has a window in the center of the west side and a door in the center of the east side, directly opposite the window. In operating this house in summer, both the door and window are removed and replaced with wire netting. The south front is always open, being closed in by one-inch wire netting only. This part of the house is where it differs from other fresh-air plans. The house is run wide open in front both night and day, storm and sunshine, all the year around. A gate is provided in this wire front to give the birds access to the yard.

"For those who are using the Tolman house in exceptionally bleak, cold locations, I recommend the use of a coarse, unbleached muslin curtain immediately in front of the roosts. The location of the roosts in my improved houses gives an excellent opportunity to place this curtain in front of the same so that it can be operated conveniently, thus insuring the best results in the coldest climate in America. The muslin curtain should be loosely tacked upon a light wooden frame, the frame being hung with hinges from the front roof directly in front of the ends of the two side roosts and should extend no lower than the droppings board. During the day when not in use, the curtain can be fastened up to the roof out of the way by means of a wooden button, conveniently placed. If, on the last visit to the house at night, the attendant thinks that the temperature is going to be many degrees below zero, the curtain may be dropped. My advice is never to use the curtain except in the most extreme cold weather, when the temperature is zero or below. I prefer to place the curtain in front of the roosts rather than in the front part of the house, for if used as I advise, more animal heat is retained and practically the same amount of fresh air reaches the birds, owing to the arrangement of the roosts and droppings board and the position of the curtain or muslin screen.

MATERIAL FOR HOUSE 8x14 FEET

300 sq. ft. hemlock boarding.
40 lin. ft. of 2x4 joists.
157 lin. ft. of 2x3 joists.
1 window, 7x8-inch glass.
1 window frame for same.
1½ M. shingles to be laid 5 in. for roof.
1½ M. shingles laid 6 in. for sides.

"From observations I have made I am sure that the most practical and economical house will be one about half as large again, or I would have my dimensions 14 feet wide, by 21 feet deep, with six-foot posts on the north end, 4½-foot posts on the south end, and a large window in the west side. The highest part of the roof would be about 10 feet from the ground. You would then have a house, ideal for all kinds of weather and locations, that would accommodate from 65 to 80 layers, according to the breed, and from four to five males, and at a very small additional cost over the figures given for the 8x14-foot house."

SMALL HOUSE WITH SEMI-MONITOR ROOF

Lower Front of This House is Always Left Open.
Sunlight Reaches Rear Part Through
Upper Windows.

The semi-monitor roof house is meeting with some degree of popularity and appears to be practical and desirable under certain conditions. The purpose of this type of construction is to secure improved ventilation and to get direct sunlight in the back part of the house. It would appear to be especially fitted for use in houses 20

FIG. 91—PLANS FOR OPEN-FRONT POULTRY HOUSE

1—Floor plan, showing location of platform, nests, etc. 2—East end, showing location of door and studs; 3—West end, with position of window and studs. For construction of front, see illustration reproduced from photo of house as it appears in actual use (Fig. 90).

FIG. 92—SIDE-SECTION OF SEMI-MONITOR POULTRY HOUSE

feet or more in width, also in the south where high roofs are not objectionable.

In the north semi-monitor houses are open to criticism, as they are almost always drafty in cold weather, and it frequently is necessary to put up muslin screens in front of the perches to protect the fowls while on the roost. In wide houses it sometimes is desirable also to divide the house through the middle with a muslin partition to prevent drafts on the floor. Figures 92 and 93 illustrate a house of this type, which is described by the designer, Dr. P. T. Woods, as follows:

"The plans given herewith are for an open-air house 10 feet wide by fourteen feet deep. A 10x14-foot house will accommodate 35 layers and may be used satisfactorily for smaller flocks of from 12 to 25 breeders. The plans are for a colony house, but same may be considered as the first sections of a continuous house, if desired.

"Fig. 92 shows side (sectional) elevation. Position of posts, studs, plates and rafters is clearly shown. Dotted lines show position of window in the west wall. Door placed between two highest studs in east wall, with bottom just below top of sill to break joint and stop draft. Door opens outward and hinges on the north side. A screen door of one-inch mesh hexagon netting should be made to open in, just inside solid door. This is useful in summer or at any time when it is desired to have door open. It will be noted that the south front is boarded down six inches from the top and up 18 inches from the bottom. The balance of space is always open, being covered only by one-quarter-inch square-mesh galvanized wire netting. The actual opening in front is two and one-half feet high by about 10 feet wide. X is a 12-inch board notched to receive rafters, and is nailed to upright studs to serve the double purpose of a support for front rafters and as a stop draft. XX is litter board, extending from floor level to four to six inches above sill, and should be used to keep litter in rear section of house. It should be made removable, resting in cleats. The front section of the house should have

sand or earth floor only. In the rear section use clean, new straw litter. This house may be made with sand or gravel floor filled in to top of sill, but we would prefer a cement or concrete floor (rat proof) to bottom of sill and filled in with sand and litter to top of sill.

"Where ground is level house stands with bottom of sills on posts or rock six inches above ground level and is boarded down to ground. Height at peak is 8 ft.; at back, 5 ft.; at north end of front section, 5 ft. 6 in., and at front, 4 ft. 6 in.—all measurements from ground.

A house built after the foregoing plans is shown in Fig. 93. To make it ratproof it was built with a double-boarded floor and was placed on posts, protected with inverted

metal pans, as shown." The following is the bill of materials for this house:

- 6 posts 7 ft. long to cut in two.
- 2 pieces 4x4 in., 14 ft. long for side sills.
- 2 pieces 4x4 in., 10 ft. long for end sills.
- 4 pieces 2x3 in., 3 ft. 8 in. long for back studs.
- 3 pieces 2x3 in., 6 ft. long for studs.
- 2 pieces 2x3 in., 5 ft. 8 in. long for studs.
- 3 pieces 2x3 in., 6 ft. 4 in. long for studs.
- 2 pieces 2x3 in., 4 ft. long for studs.
- 4 pieces 2x3 in., 3 ft. 4 in. long for studs.
- 3 pieces 2x3 in., 10 ft. long for plates.
- 2 pieces 2x3 in., 10 ft. long for droppings board and door.
- 2 pieces 2x3 in., 10 ft. long, with rounded edges, for roosts.
- 5 pieces 2x4 in., 8 ft. 9 in. long for rear rafters.
- 5 pieces 2x4 in., 6 ft. long for front rafters.
- 58 sq. ft. matched boards for droppings board and door.
- 460 sq. ft. common boards for sides and roof.
- 1 full window (2 sash six-light) 4 ft. 3 in. x 2 ft. 6 in.
- 3 three-light cellar window sash for monitor top.
- 10 running feet of 1/4-inch, square-mesh, heavy galvanized wire netting, 30 in. wide for open front.
- 500 sq. ft. best roofing fabric with caps and nails.
- Bundle shingles for making eaves on north and south sides.
- Nails, hinges, spikes, screws, etc.

This plan may readily be adapted to a house of larger size by making the following changes: For a colony house to accommodate a flock of about 100 hens, or for sections of the same capacity in a continuous

FIG. 93—SMALL SEMI-MONITOR POULTRY HOUSE

house, it is recommended that the floor dimensions be 20x20 feet, with the rear section 12 feet deep. The rear should be 5½ feet high, and the front of the monitor section 9 feet. The low section should be 6 feet where it joins the monitor section, and 4½ feet in the front. Four 6-light sashes should be provided for the monitor top. Two sashes of the same size are placed side by side in the west wall—opposite the door—and another is placed well up in the front section, on the east side near the door. A solid partition reaching from floor to roof is placed in the middle of the pen and extending to within 9 ft. 6 in. of the front, from which point an 18-inch partition extends clear to the front. This partition is to protect the fowls from drafts while on the perches and on the floor. If a continuous house is built it is recommended that solid partitions be provided between pens.

SEMI-MONITOR HOUSE AT OHIO EXP. STATION

Large Houses of This Type Must Have the Front Enclosed With Glass and Muslin for Use in Cold Weather.

By W. J. BUSS

This house is 24x100 feet in size. It is divided into six pens, each 15x24 feet, and a feed room, 10x24 feet. The feed room is located in the center of the house. Partitions of matched sheathing divide the feed room from the pens. Partitions of two-inch mesh poultry netting are used to divide the pens.

A concrete foundation wall is used under the house. A tile drain was laid in the outside bottom of the trench dug for the wall. No wooden sills are used on the concrete wall. The studs are fastened to the wall by means of an iron pin placed in the bottom of each and in the concrete wall.

No artificial floors are used in the pens. A concrete floor is used in the feed room. On ground that is not

FIG. 95—A SIX-PEN SEMI-MONITOR LAYING HOUSE

The house illustrated above is in successful use on the poultry plant of the Ohio Experiment Station and is recommended by the Station as adapted to Ohio conditions generally. The narrower openings in the lower front are protected by muslin shutters in severe weather. The larger openings, also all those in the upper front, are equipped with glass sashes—not all in place at time photo was taken.

well drained, artificial floors would probably be needed to prevent the pens from becoming damp.

The deeper openings shown in the front of the house in Fig. 95 are fitted with windows for cold weather use; the shallower ones, with curtains. The curtain frames are made of 1x4-inch strips, nailed together at the corners. These frames are covered with a very thin grade of muslin. Two doors in the rear of each pen near the eaves are not shown in the illustrations. These are 20 inches high and 45 inches long. All windows and curtained openings and openings for the doors in the rear of the house are closed with one-inch mesh wire netting. This netting in one of the curtained openings in each pen is fastened to a removable frame, which makes a convenient place through which to put straw into the pens and remove the litter.

The windows in the upper part of the house are hinged at the bottom to swing in. The curtains and windows in the front of the house are hinged at the top to swing in. The doors in the rear wall of the house are hinged at the top to swing out. Probably a more convenient arrangement for these would be to hang them to swing in.

The walls of the house are of a single thickness of matched siding. The roof is made by laying one thickness of matched sheathing on the rafters and covering this with one of the better grades of prepared composition roofs, of which a number are on the market.

A house of this type, of a size to accommodate the desired number of fowls, should prove satisfactory in places having the same latitude as Ohio, and probably even farther north or south. This house has been found especially satisfactory during hot weather. In colder climates the windows in the upper part of the house could probably well be double-glazed to prevent radiation to a considerable extent. It might appear, at first sight, that the cost of construction of a house of this type would be greater than of a shed roof house of the same dimensions. It will be found, however, that there will be very little, if any, difference in the cost, when both houses are built of the same grade of material.

FIG. 94—ELEVATED POULTRY HOUSE AT MISSOURI STATE POULTRY EXPERIMENT STATION

LAYING HOUSE WITH ELEVATED FLOOR

Houses With Floors Several Feet Above Ground Are Especially Well Adapted to Damp Locations

Under many conditions, especially in flat, damp locations, a house with an elevated floor is often desired. The house illustrated in Fig. 94 is one that has been in use at the Missouri State Poultry Experiment Stat. and is highly recommended. The general details of this house will be readily understood from a short study of the illustration. It is 14x28 feet and has a capacity of over 100 hens. The upper part is equipped with the slatted ventilators that were originated at this station. The lower story is five feet high, making it easy to work in. A substantial concrete foundation is provided, but the underpart has a dirt floor. The entire front underneath is open and in the coldest weather that may be expected at this station the fowls are comfortable and happy, wallowing in the dust and soaking in the sunshine. Regarding this house, Dr. Patterson, formerly Director of the Station, writes:

"We find the second story of this house to be drier than our one-story houses. The opening for the stairway which goes up on the inside of the house is under the droppings board, and as carbon dioxide is heavier than air, it gives an opportunity for it to pass out by going down through this opening. The lower story affords what we might term semi-outside conditions. The temperature and air are about the same as out of doors, but the birds are protected from the storm.

"Where a number of hens are kept in one flock and more than one male is used, the fertility is much better with the two-story house, for there is always a boss in the flock, and as he cannot be upstairs and down at the same time, he cannot control the situation as he does in the one-story house. The contractors who have built our houses estimate that the cost of the two-story house will be the same as the one-story house with a concrete floor.

"We find that with windows under the droppings board in the rear of the house, light is admitted to all parts of the floor, and as the hens usually scratch from the light in order to see their food, they keep the litter evenly distributed over the floor. We also find that the fowls like to be in a good light during bad days when they are confined to the house."

WESTERN WASHINGTON POULTRY HOUSE

Popular for Housing Large Flocks in the Northwest. Has Special Labor-Saving Attachment for Raising and Lowering Curtains.

By GEO. R. SHOUP

The plans show a house 20x50 which is designed to hold 300 Leghorn layers. Each bird has only $3\frac{1}{3}$ sq. ft. of floor space, but each also has 1000 sq. ft. to roam around in, and is far happier and more contented and will lay more eggs than though she had five sq. ft., as in a house 8x12 with 20 birds.

Walls.—In this climate 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 mites. Since the double wall is an expensive luxury, we advise doing away with the studding (the up-and-down 2x4's) entirely. To accomplish this we run the boards up and down. Along the top of the sill a 2x2 strip is spiked on top of the sills all the way around and $\frac{3}{4}$ of an inch from the outside edge. To this strip the boards are nailed, at the bottom, just flush with outside of the sill and resting on it. We insist that rear windows under the dropping 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.

The inside of wall is then covered with a strip of light-weight asphalt paper. This paper is brought up two inches above the rear wall so that it can be cleated 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 dry 10-inch shiplap, is turned outside so that it can readily be painted. The dropping 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. The minimum height of rear wall should be 5 feet 4 inches, made by cutting a 16-foot board into three pieces. 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

FIG. 96—DIAGRAM OF FRONT, AND CURTAIN RAISING DEVICE FOR WEST. WASHINGTON LAYING HOUSE

This illustration is reproduced from Western Washington Monthly Bulletin. It shows front of house for commercial laying flock, and method of adjusting curtain. See text for key to lettering. Complete plans on next page.

their own heat, which is essential for their comfort in cold weather.

Run the boards up and down in the two ends also, with the smooth side out, covering all the inside with asphalt paper. Leave a three-foot opening for a door

and the rear 2x6 inches 14-foot long with a 3-foot eave in front and a 1-foot eave in the rear. This 3-foot eave in front gives a slightly appearance to the coop and affords the necessary protection to the opening with its curtain and the feed trough, which is required in this particularly rainy climate. We use an 18-inch eave over the gable ends with a 6-inch face board. 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 10-inch shiplap for the sheathing boards. 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.

Use 1x6-in. x 16-ft. for rafter collar beams, bringing them down as low as is consistent with ample head room. These act as girds and really hold the building together.

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 every 5 feet on 4x4 sills, made of 2x4's spiked together. No. 3, 4-inch flooring gives a satisfactory chicken coop floor.

Dusting Bath—Reserve 18 inches of the entire length of the front floor area of the coop for a dusting bath. 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 12-inch board retaining the litter. 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 rolling curtain illustrated in Fig. 96 can be either raised or lowered in a few seconds, and can easily be handled in one curtain 6 feet wide and 20 feet long by one winding of the crank at the end. When not in use it is rolled up at least a foot above the opening under the eave and is kept perfectly clean and dry and ready for instant use whenever needed. The anchor ropes L and K wind up as the curtain comes down, and lock it at any height the operator chooses. The guard rails J placed at intervals of about 20 feet prevent the curtain sagging out when a door of the coop is opened, and an outward pressure of air is created.

The roller is built up of 2-inch half rounds, which are nailed firmly together, enclosing the bottom of the curtain. This roller can be made any desired length simply

FIG. 97.—PLANS FOR BUILDING THE WESTERN WASHINGTON POULTRY HOUSE FOR COMMERCIAL FLOCKS

House as here planned is to be built with a board floor, but a concrete floor is recommended wherever possible to provide it. The house for which this plan was originally prepared was to be equipped with trap-nests, but regular platform nests may be used instead. Note the incline at each end of the house leading up to door, which is 16 inches above ground level. Note, also, manner of constructing dust bath, shown in cross section at lower right-hand corner. Reproduced from West. Washington Monthly Bulletin.

6 feet 6 inches high. The front wall is seven feet high. It consists of one 12-inch board at the bottom, a 4-foot opening the entire length, and two 12-inch boards cleated together one above the other at the top. The 7-inch rafter notches are cut in the top board every 3 feet to correspond with the rear notches.

Roof.—The front rafters are 2x6 inches 12-foot long

by breaking joints. The hoisting device may be described as one main line rope (wire preferred) which is attached to the loose ends of a series of loops. One end of each of these loops is anchored to the building above the top of the curtain, Figs. D, F and E. The loop is then brought down under the roller and run through a small iron awning pulley, which has been fastened securely to the overhanging eave close to the place where the end of the loop is anchored. The loose ends of loops are then tied to the main line, adjusting them so that they all lift at the same time when the main line is tightened. The loop nearest the crank D, B, N, H, has to be carried back on the main line far enough so that the knot H does not block the pulley M when the main line is wound up in raising the curtain. This necessitates the use of the extra pulley N. All other loops are duplicates of G, C, F, and are placed at intervals of 15 feet when a 2-inch roller is used and at every 10 feet when a smaller roller is used.

CANADIAN FARM POULTRY HOUSE

Houses Built After This Plan Are in Use in Nearly Every Province in Canada and Give Excellent Satisfaction.

By PROF. F. C. ELFORD

This house holds one hundred hens. It is 16x32 feet and is divided into two pens, each 16 feet square. The house has given satisfactory results on the experimental farms' system for several years. It has been used in every province in the Dominion and may be built with a single roof or with double roof and straw loft. At Ottawa the straw loft house has been drier but colder than the shed roof house. There has been absolutely no moisture in the litter or adhering to the walls of this house. Both houses are built without drop boards, the roosts being fastened to the wall and the nests are contained in a cabinet along the outside walls. No trenches are dug for the foundations, as the concrete slab which serves as both foundation and floor is laid directly upon the ground, the top being from 10 to 15 inches above the surrounding level. (See page 14 for method of constructing a concrete slab floor.—Ed.)

The walls consist of two by four studding, resting on

FIG. 98—CROSS SECTION OF CONCRETE COMPARTMENT HOUSE

Courtesy of Alpha Portland Cement Co.

FIG. 99—CANADIAN FARMER'S POULTRY HOUSE

This house is a little above the average in cost, but in Canada, where the winters are long and severe, it pays to make the laying flock comfortable—in fact, is essential to good egg production at that season. Photo from Dominion Experiment Farms, Ottawa, Canada.

a two by four sill, and supporting a plate of two 2x4's. These studs are covered outside with only one ply of tarred paper and one inch tongue-and-groove boarding, or one-inch boards and battens. On inside, behind and around the ends of the roosts, the studding is covered first with tarred paper, then with one inch tongue-and-groove boarding. Inside partitions are covered with wire mesh to within 2½ feet of floor, rest of partition one inch boarding. The rafters are two by fours covered with one inch sheathing and ready roofing, or, if preferred, tarred paper and good cedar shingles, laid 4½ inches to the weather. Windows are built between studs as shown, and fitted with frames for glass, or cotton where indicated. All sashes to be hinged to swing in. Outside of all window openings is covered with one inch wire mesh.

LIST OF MATERIAL REQUIRED FOR FARM POULTRY HOUSE WITH GABLE ROOF AND STRAW LOFT

Studs, 2 inch x 4 inch—262½ lin. feet.....	175.5
Plate, 2 pcs. 32 feet x 2 inch x 4 inch—64 lin. ft.....	43
Sill, 2 pcs. 32 feet x 2-inch x 4-inch—64 lin. ft.....	43
Sill, 2 pcs. 16 feet x 2-inch x 4-inch—32 lin. ft.....	21
Rafters, 24 pcs. 10 feet x 2 inch x 4 inch—340 lin. ft.....	227
Floor (T & G) 512 sq. ft. (plus 10%).....	564
Roof boards, 680 sq. ft.....	680
Shingles, 680 sq. ft.....	680
One roll building paper.....	
Wall boarding (T & G) 800 sq. ft. (plus 10%).....	880
Ceiling joists, 17 pcs. 16 ft. x 2 in. x 4 in.—272 lin. ft.....	187
Ceiling boards, 68 pcs. 32 ft. x 1 in. x 3 in.—2176 lin. ft.....	384
2 windows 5 ft. x 5 ft. and frames, cotton, and wire mesh.....	
4 windows 3½ ft. x 5 ft. and frames, glass and wire mesh.....	
2 windows 3 ft. x 3½ ft. and frames, glass only.....	
2 doors 2 ft. 9 in. x 6 ft.....	
2 louvered windows 2 ft. x 2½ ft.....	
Paint (3 coats), hardware (hinges, nails, etc.).....	

FOR TWO-INCH CONCRETE FLOOR

5 bbls. cement.....
1½ cu. yds. sand.....
2¾ yds. gravel.....

A CONCRETE POULTRY HOUSE

Practical Plans for Concrete Compartment House. Dry and Comfortable if Properly Constructed.

Concrete is coming more and more into use for all kinds of farm buildings, and many concrete poultry houses have been built, giving good satisfaction as a rule. Concrete walls are inclined to be damp, especially in wet weather, and some objection has been made to the use of this material on that account. However, dampness is largely a matter of ventilation, and cement manufacturers insist that if this is properly attended to there will be no difficulty.

A concrete house with an alleyway, that can be built in any length and that is designed to serve either as a breeding house or laying house, is shown in Figs. 98 and

100. This plan is furnished by the Alpha Portland Cement Co. and will readily be understood in its general details without a lengthy description. The floor should be laid of one part of cement to two parts of sand and three of stone or gravel. The wall mixture is given as 1:2½:4. The proportions suggested for the floor seem to indicate that considerable stress is expected to be borne, which, of course, is seldom the case. It is probable, therefore, that a mixture of 1:2½:4 will answer just as well for the floor. The plan here given calls for a four-inch wall, but a six-inch wall is recommended in general practice. This house as here illustrated provides four pens, each 11 feet x 12 feet 3 inches. The outside dimensions are 16x45 feet. In a general way the interior is similar to that shown in the six-pen breeding house, shown in Figs. 107 and 109-113. The passageway partition, however, is somewhat different, as it is intended that all feed hoppers, troughs, water vessels, etc., shall be placed in the passageway, the fowls having access to them through slats placed in the partition under the nests. In the plan the passageway is three feet wide, but we would suggest that this be changed to four feet. A three-foot passageway obstructed by feed hoppers, water vessels, etc., will be found extremely inconvenient. Four feet is none too wide for the purpose, the extra width being secured by making the house a foot wider or by taking it off of the pens.

It will be noted that above the nests the partition is to be of solid cement plaster on metal lath. This is an excellent feature and it will be a further improvement if the partitions between the pens are all of similar construction for the first six feet back from the door, thus giving the fowls a three-sided roosting closet which will protect

them from any air currents while on the perches. As will be seen in the cross-section, this house is provided with collar beams, on a level with the front plate and it will be an easy matter to provide a straw loft, covering the beams with narrow boards and filling in the space between them and the ridge with straw. If the floor of this house is properly constructed, it should be dry and warm, but the straw loft will greatly assist in keeping the house comfortable in severe weather. The perch supports, of course, are to be hinged at the back to swing up out of the way when the platform is being cleaned.

Straw Poultry Houses

On farms where small grains are extensively grown and where the straw has little cash value, one of the least expensive poultry houses that can be built is a straw house. When properly built such a house will be found comfortable and healthful for the fowls and can be made convenient for the caretaker as well.

Straw houses are seldom damp, and they are always warm in winter and cool in summer. The supporting frame should be substantial, as it has to carry a heavy weight, and the straw roof must be carefully built in order to insure its being rain-proof. In building straw sheds or houses it is especially important to pack the straw by persistent tramping as the walls are built up, otherwise the straw will settle and separate along the line where walls and top meet. If the inside of the house is lined with poultry netting, this will prevent the fowls from picking and scratching the straw from the walls, which they are certain to do if no protection is provided. Avoid trouble with mites by keeping perches away from walls.

FIG. 100—PLANS FOR COMPARTMENT HOUSE BUILT OF CONCRETE

Comfortable Houses for Breeding Pens

Why Houses for Breeding Pens Should Be Especially Designed—Plans for Low-Cost Buildings Accommodating One and Two Small Flocks—Comfortable Houses that Can Be Built to Provide for Any Desired Number of Pens—Breeding Houses for Cold and Moderate Climates—Plans Designed to Save Time and Labor of Attendant and to Provide Most Favorable Conditions for Fowls.

THE chief requirements of breeding houses, as compared with laying houses, are that the former should be more warmly constructed, and they usually are smaller in size, as it seldom is desirable to keep breeding fowls in large flocks. Breeding pens generally are allowed more floor space than would be given to the same number of fowls in regular laying flocks. For this reason there is comparatively little bodily heat available for warming their house or pen, and this must be offset by warmer construction. Where several pens are to be kept in a compartment house, a passageway along the rear usually is provided, in order to economize time and avoid disturbing the fowls unduly in regular daily care.

ONE-PEN BREEDING HOUSE

Convenient House for Small Breeding Pen. Equipped With Elevated Dust Box.

By F. W. CARMEN

For a breeding house for one small pen, the one illustrated in Fig. 101 is practical and convenient. Note especially the arrangement for a sunny dust box, which will be greatly enjoyed by the fowls in winter when it is impossible for them to get outdoors. With breeding stock it is especially necessary to take all practical steps to insure the comfort of the fowls, if fertile, strongly vitalized eggs are to be produced in the winter months.

The house is 14 feet long, 10 feet wide, seven feet high in front and six feet in the rear, with shed roof. It may be built singly, or two or more in a row. The frame is made of 2x4 hemlock, and the siding, drop boards, etc., are of N. C. pine, eight inches wide. The back, sides and roof are covered with tarred paper, and the roof has an extra covering of roofing paper. Give the floor a good layer of sand and then put about six inches of hay or straw on that. In the front of the building, on the west side, 18 inches above the floor, is a dust box three feet wide, six feet long and eight inches deep. Eighteen inches of this box projects beyond the front of the building, and when the sash is in position the whole thing forms a sort of bay window. You will be surprised to see how the chickens enjoy a dust bath in this window. Under the part that comes in the building build six nest boxes about 12x14 inches. Over the dust box (with the top hinged to the building and the bottom resting on the outer edge of the box) is a hot bed sash 3x6 feet. This sash can be raised in warm weather, and with a cover over it for a sunshade, it is a fine, cool place for biddy. The door to the pen is in the front near the east side and is divided

into two equal parts, top and bottom, each part being 3x3 feet. A curtain three feet square is used for the upper half and is hinged on the outside.

This curtain is very useful on stormy days when the wind blows hard. The roost platform is two feet from the ground and is four feet wide and seven feet long. To make the platform, we batten six pieces of eight-inch boards together and board up where the end of the roost comes, allowing the boards on the end to go two inches below the roost platform so the platform has a cleat to slide on, and in that way it is an easy matter to remove and clean. Make the roost poles of 2x3 material and round the upper edges. Secure them at the ends by patent brackets, or notch out a block and nail on each side of them to fit in. They are placed six inches above the platform, the rear one being 14 inches away from the back of the building, and the front one 18 inches from the back one.

This house will take about 600 square feet of boards, 15 wall strips 14 feet long, six rolls of tar paper and three rolls of roofing paper, besides one hot bed sash 3x6 and four pairs of hinges, nails, etc.

SMALL TWO-PEN BREEDING HOUSE

The House Used in Connecticut Egg Laying Contest. Accommodates Two Breeding Flocks of 12 to 16 Fowls Each.

By ROY E. JONES and LESLIE E. CARD *

Frequently the back-yard poultryman who is systematically breeding, either for exhibition quality or to establish a high egg-laying strain, needs a convenient house for two or more small pens. For this purpose the house used in the International Egg-Laying Contest at

FIG. 101—PLANS FOR BUILDING ONE-PEN BREEDING HOUSE

FIG. 102—CROSS SECTION OF TWO-PEN BREEDING HOUSE
Reproduced from Bulletin 81, Storrs (Conn.) Experiment Station.

the Connecticut (Storrs) Experiment Station is especially desirable.

This house is 12x12 feet, 6 feet high at the eaves and 8 feet 4 inches at the peak. It is divided through the middle in order to accommodate two pens. With the partition removed it would afford sufficient capacity for 30 to 35 hens. For ordinary use, where it is not desired to trap-nest, the back may be cut down at least a foot and the roof made two-thirds instead of even span, thus reducing the air space and making the house warmer. The house, as shown, gives more head room for the attendant, and this is important when birds are being trapped and many trips have to be made to the back part of each pen.

Fig. 104 shows a general view of this house, indicating size and location of doors and cloth curtains. The muslin curtains are hinged at the top and swing in, being fastened up by means of hooks made from thin strap iron. Fig. 102 is a cross section of the house. The windows slide toward the front. The roosts and droppings boards are movable, as are also the trap-nests which are hung beneath the droppings boards. The exit door for the hens slides up and down and is held open by means of a piece of wire looped over a nail in the door. The 2x3-inch girder across the end of the house is placed in such a way as to support

FIG. 103—FLOOR PLAN OF TWO-PEN BREEDING HOUSE

Reproduced from Bul. 81, Storrs (Conn.) Exp. Station.

the droppings boards at one end and the window at the other. The feeding rack, which supplies both pens, is made of slats so that all filth may fall through to the floor. A large enough opening is left above to admit a drinking pan which supplies both pens. The feeding rack also supports a mash hopper in each pen. Small removable boxes for grit, shell and charcoal are fastened to the partition above the feeding rack and within easy reach. The rear half of the partition between the pens is boarded up solid, while the front half is boarded for only two feet from the floor, or to the level of the curtain sill in front, the upper part being made of two-inch mesh wire netting. The house is being used with a dirt floor, but is so constructed that a board floor may be put in if it is found desirable.

Following is a bill of materials for this house:

BILL OF MATERIALS

Skids—2 pieces, 4x6 in., 14 ft.
Studding—12 pieces, 2x3 in., 12 ft.
Rafters—5 pieces, 2x3 in., 14 ft.
Matched boards—700 feet, board measure.
Roofing paper—4 roofs.
Windows—2 sash, each containing 6-10x12 in. lights.
Unbleached muslin—3 yards, 36 in. wide.
Wire—25 feet 2 in. mesh, 36 in. wide.
Nails—10 lbs. 8d., 5 lbs. 10d., 4 lbs. 20d.
Hinges—4 loose-pin butts for curtains, 4 T-hinges for doors.
Locks or latches for doors.

* From Bulletin 81, Storrs (Conn.) Exp. Station.

FIG. 104—PRACTICAL HOUSE FOR TWO SMALL BREEDING PENS

Photo from Storrs (Conn.) Exp. Station.

THE MINNESOTA MODEL HOUSE

Especially Recommended for Breeding Flocks. Also is
An Excellent House for Regular Laying Flocks
Where Winters Are Severe.

By PROF. A. C. SMITH

This house is designed to meet the requirements of the average Minnesota poultry keeper, particularly the farmer, and it is believed that it does this to an unusual extent. The four principal faults to be found with ordinary poultry houses, particularly as they apply to Minnesota conditions, are:

1. They are not well constructed, and consequently are too cold in winter. Much better egg production might be had during the winter months if the houses were more comfortable.

2. They have a poor system of ventilation, if any.

This results in the house being too damp or too cold. In many houses no provision whatever is made for ventilation, other than leaving the door open for a certain length of time on a mild day, which in this climate very often cools the house too much. Even when provision for ventilation is made, it is often by a system that does not give opportunity for sufficient regulation to meet changes in the weather, as by hinged windows or muslin frames, which must, from the nature of their construction, be either closed, and supply insufficient ventilation, or wide open, when frequently altogether too much cold air enters and altogether too much heat escapes. For the above reasons, particularly when south winds prevail during cold weather, these hinged windows or curtains must be closed. Through glass windows no moisture escapes, and through muslin too little escapes, because it is too closely woven. Houses with insufficient ventilation are always damp, and the air they confine is impure. The odor in such a house is always offensive, even if the impure air is not a menace to health, which might be questioned. Dampness is, beyond doubt, the greatest menace to good health and good production in the poultry house.

3. Poor floors. Earthen floors, the top of which is below the outside level, make the houses very damp and uncomfortable. Wooden floors are hard and are often very cold, unless covered with a deep litter of straw or leaves—and even these should be on top of a three or four-inch layer of fine sand. In the absence of sand or loam, shavings probably make the best substitute.

4. There is no provision for separating the flock. There are many seasons during the year when it is most advantageous to separate the flock. In the fall there often are many surplus cockerels, not ready for market, which cannot be kept with the females except to the detriment of both; for under such conditions the cockerels gain very little weight, and the females being constantly annoyed, develop slowly and lay poorly. To get a good return for food and care, the cockerels must be separated from the females. If the hatches were early, the cockerels should be sold before it becomes necessary to house them, because the price will be considerably higher than later in the season, when the market is glutted with stock.

A two-pen house is advantageous in that the pullets and hens of the flock may be separated. Pullets are sure to be intimidated by the older birds, and do much better when kept in separate flocks. In the spring, again, a two-pen house is a distinct advantage, since the most rugged and healthy specimens may be separated and used exclusively as breeders. These may be allowed more room per bird, fed differently, and provided with greater range, while the balance of the flock is forced for eggs. When these existing conditions are considered, it is believed that the following features of this plan will meet the approval of poultry keepers in general:

The fundamental idea in ventilating a poultry house is to expel the impure air as well as the excess of

FIG. 106—DETAIL OF VENTILATOR IN MINNESOTA HOUSE

moisture, and to retain at the same time sufficient heat to make the house comfortable; which last, in the coldest weather, means all the heat that can be retained while expelling excessive moisture and impure air. A simple ventilating device adopted for this house places the control of the ventilation absolutely in the caretaker's hands. It is, however, recognized that all ventilation in a poultry house must come from one direction—that is, drafts cannot be tolerated.

By hanging the windows with weights and pulleys as they are ordinarily hung in dwellings, a greater or lesser volume of air—depending upon the will of the caretaker—may be allowed to enter. This will be found equally advantageous in winter and summer, and makes it unnecessary to remove the sash, even in very hot weather, since by raising the lower sash three or four inches and dropping the upper to the level of the lower, good circulation is established. The object in raising the lower sash no more than three or four inches and lowering the upper to the same level, is two-fold, but the main reason for so doing is that the large opening, which is in this way provided at the upper section, permits a large volume of hot air to escape. A secondary reason is that, with the lower sash no higher, the fowls cannot roost upon or soil the windowsill, whereby just so much cleaning is eliminated.

During the winter it is convenient to drop the upper sash a little through the day to let the dust and moisture out. In the Minnesota Model Poultry House the ventilation secured in this way might be called emergency ventilation, or, perhaps, ventilation according to season, the constant ventilation or the ventilation depended upon during winter, coming chiefly through openings above the windows. These openings may be covered or not, and in two ways: on one side of the inside frame is hinged a burlap-covered frame, while on the other a solid wooden door is hinged. Obviously the caretaker has three options: He may leave the opening entirely uncovered—as he certainly should during warm weather and upon an occa-

FIG. 105—FRONT ELEVATION AND CROSS SECTION OF MINNESOTA MODEL POULTRY HOUSE

Reproduced from Minnesota Farm Inst. Annual No. 27.

FIG. 107—DETAIL OF PEN FRONT IN SIX-PEN BREEDING HOUSE

sionally mild day in midwinter, particularly if the building has for any cause become damp, as will be the case if frost accumulates on the walls and vaporizes so rapidly that the air will not hold the moisture and the litter becomes damp from the drip—a situation which may be avoided by opening both the wooden door and the burlap frame. Secondly, the caretaker may close the opening with the burlap frame. This is the method of securing ventilation during cold weather. The coarse meshes of the burlap do not clog with dust as the finer meshes of cotton do, and they allow the moisture to escape, while retaining considerable heat and preventing a draft. In ordinary winter weather, during the day, ventilation should be obtained through this burlap, while on very cold nights the wooden door should close the opening. Clearly, it is not necessary to treat all three openings alike at the same time, since one only, or two, may be opened.

A cement foundation wall is best and most desirable for three reasons: First, it is most durable; second, it gives better support to the frame than posts or pillars; third, almost every poultry-keeper in these days is familiar with simple cement construction. The wall should be one foot thick at base and eight inches at the top, and should be fifteen inches above the ground-level. This construction allows the door to swing over the litter, which is a convenience.

When there is a supply of gravel or sand on the farm, or this material can be obtained without too great expense, a floor of gravel and sand or gravel and loam is

advised, on account of its naturalness and comfort. Fill in at bottom with three inches of coarse gravel or small stones; then four inches of finer gravel, covering with a little clay, and roll or tramp hard. This will make a good cleaning-line. Next cover with four inches of fine sand or dry loam, or a mixture of both. This last layer should be cleaned out every summer and replaced by a fresh, clean supply. The layer of sand has a fertilizing value after it has been in the house for a year. If it is sifted when put in, it makes a suitable top-dressing for lawns or hay-fields.

Nail matched boards, running up and down, to outside of frame. Paint at once with two coats to avoid

shrinkage. If a warmer house is desired, cover the walls with double-ply tarred paper, in one or two layers, as desired. If a still warmer, better-looking, or more expensive house is desired cover this with shingles or siding.

When the wall consists of but one thickness of boards, this house may be built at as little cost as it is possible to construct a comfortable and durable poultry house. On the other hand, when the wall consists of two thicknesses of boards with one or more thicknesses of building paper—or, better still, two thicknesses of double-ply tarred paper between the boards, the house becomes not only very warm and comfortable, but an attractive farm building; and if kept in repair and painted, will so remain indefinitely. Furthermore, this evolution from a single wall to one with double thickness of boards, between which is a double layer of paper, may take place at the time of building, or it may progress as gradually as the owner decides.

For the roof, matched boards and good, heavy roofing paper will be found entirely satisfactory. Because a great deal of heat may escape otherwise, the roof should be tightly built; hence matched boards are necessary with either shingles or roofing paper. It is folly carefully to build a warm and tight wall to hold the heat, and then cover the building with a loosely constructed roof which will certainly allow the heat to escape, making the house colder by several degrees. Other specifications, dimensions, etc., will be found on the accompanying plan. (See Figs. 105, 106, and 108.)

FIG. 108—FLOOR PLAN AND END ELEVATION OF MINNESOTA MODEL POULTRY HOUSE
Reproduced from Minnesota Farm. Inst. Annual No. 27.

FIG. 112—DETAIL OF FEED TROUGH AND WATER VESSEL IN BREEDING HOUSE

The feed trough, hinged at bottom, is shown open for filling from the passageway, in Fig. 1. A cross section of open trough is shown in Fig. 2. When feed is placed in trough and closed it is in position shown in Fig. 3, and fowls in pen have full access to contents. Door giving access to water vessel is also shown in Fig. 1, while Fig. 5 shows door closed. Fig. 4 shows cross section of trough when open for filling.

CONVENIENT EIGHT-PEN BREEDING HOUSE Just Right for a Number of Single Pens. Passageway Simplifies Care of Flocks and Avoids Dis- turbance of the Fowls.

Poultrymen, as a rule, do not now favor laying houses with a passageway in the rear, and there are a number of practical objections to this feature. Under some conditions, however, and especially when a number of small breeding pens are to be provided for, such passageways are quite convenient. The plan shown herewith has proved especially satisfactory.

This house may be built any length, but as here outlined is 96 feet 6 inches long and 16 feet wide, with a three-foot alleyway. There are eight pens, each with a capacity of 25 to 35 hens in laying flocks and about half this number if the birds are to be used as breeders. Board floor and post foundation are indicated, but a concrete foundation and floor will be found to be much cheaper in the long run, as well as more sanitary and durable, also rat-proof. If a board floor is decided upon it should be made double, as shown in Fig. 14, on page 16, especially where winters are cold.

All walls are ceiled with $\frac{3}{4}$ -inch beaded ceiling, but no ceiling is provided overhead, though this is recommended for extreme climates. The roof is supported on a 4x4-inch girder resting on 2x4-inch studs that form part of the alleyway partition. One by six-inch tie pieces are run from the rear wall to the alleyway studs, as in Fig. 111, and no other tying or bracing is required.

In order to protect the combs of valuable breeders, a roosting closet is provided in each pen. Canvas partitions extend from the droppings boards to the roof and the alley partition back of the perches also is canvas, the lower part being made in the form of a shutter so that the platform may be cleaned from the alley. In front of the perches a muslin-covered shutter is provided (see Fig. 111) which can be lowered after the fowls have

gone to roost. When enclosed in this roosting closet there is practically no danger of combs and wattles being injured by freezing, no matter how cold it may get. As ventilation is generally inadequate under such conditions, however, the front curtain should only be let down in the severest weather.

In order to prevent drafts through the house, alternate cross-partitions are ceiled from floor to roof. The other cross-partitions are boarded up tight to a height of three feet from the floor and covered with two-inch mesh netting from that point to the roof.

For the breeding pen, trap-nests should be used. Full details of different styles of such nests are given in Chapter X.

Fig. 110 shows the floor plan of this house, with arrangements of partitions, droppings platforms, perches, etc., clearly indicated.

Fig. 109 gives front elevation, showing windows, muslin shutters, yards, doors, etc.

Fig. 111 is a cross section of the house, showing par-

FIG. 113—FRAMING FRONT OF BREEDING HOUSE

tion, nests, and a cross-section of the roosting closet. Note that the outside doors of the house are double boarded, inside boards being placed diagonally and outside boards perpendicularly. Fig. 107 gives a section of the pen front or inside elevation of pen, showing partition doors, wire partition, canvas doors in front of perches and solid canvas partition from perches to roof.

FIG. 114—PARTITION IN BREEDING HOUSE FOR MILD CLIMATES
Reproduced from *Farmers' Bulletin* 574, U. S. Department of Agriculture.

BILL OF MATERIALS FOR BREEDING HOUSE

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, sides	4x6	10	20	
Sills, sides	2x4	10	20	
Sills, end	4x6	16	2	
Joists	2x6	16	50	
Girders	4x6	16	6	
Plates	2x4	10	40	
Studs, front	2x4	12	28	1 piece cuts 2
Studs, back	2x4	14	25	1 piece cuts 2
Studs, ends	2x4	16	7	1 piece cuts 2
Studs, partitions	2x4	16	35	1 piece cuts 2
Short studs and misc.	2x4	10	20	
Ridge plate	4x4	10	10	
Ridge	2x6	10	10	
Rafter	2x6	14	50	
Rafters	2x4	10	25	1 piece cuts 2
Rafter ties	1x6	12	9	1 piece cuts 2
Support for drop. plat.	2x4	14	8	
Perches	2x4	12	8	
Roof boards	1x10		2000 bd. meas.	Surfaced
T & G siding	1x6		1650 bd. meas.	
Subfloor	1x10		1700 bd. meas.	
Matched flrg., top fl.	$\frac{1}{2}$ x4		2000 bd. meas.	
Matched flrg. for drop. plat., doors, etc.	$\frac{1}{2}$ x4		300 bd. meas.	
Beaded ceiling for walls				
ceilings & partitions	3-16x4		4300 bd. meas.	
Barge boards	$\frac{1}{2}$ x6		250 lin. feet.	Surfaced
Sills for windows, etc.	$1\frac{1}{2}$ x8		150 lin. feet.	Surfaced
Frame for windows and doors	$\frac{1}{2}$ x6		350 lin. feet.	Surfaced
Weather strips	$\frac{1}{2}$ x $\frac{1}{2}$		170 lin. feet.	Surfaced
Trim lumber	$\frac{1}{2}$ x4		500 lin. feet.	Surfaced
Frames for muslin shutter, perch shutters, perch supports and misc.	$\frac{1}{2}$ x3		600 lin. feet.	Surfaced
Nest doors	1x8		60 lin. feet.	Surfaced
Partition door frame	1x4		25 lin. feet.	Surfaced
Partition door frame	1x3		150 lin. feet.	Surfaced
Furring for bridging	1x2		500 lin. feet.	

Galvanized doors, wire staples and wood triggers for forty nests.

- 20 squares of prepared roofing.
- 15 squares of waterproof sheathing paper for the floor.
- 8 check rail windows, 12-light, 10x12-inch glass.
- 450 sq. ft. of 2-inch mesh poultry netting for partitions, etc.
- 260 sq. ft. of 1-inch mesh netting for windows and open front.
- 400 sq. ft. of muslin for shutters and perch curtains.
- 400 sq. ft. of canvas for alley and end partitions.
- 2 pr. 8-inch T-trap hinges, outside doors.
- 2 6-inch hasps.
- 8 pr. 3-inch hinges for partition doors.
- 2 doz. pr. 2 $\frac{1}{2}$ -inch butt hinges for muslin shutters, canvas doors and nest doors.
- 18 2-inch screw hooks and eyes.
- 8 pr. 4-inch strap hinges for perch supports.
- 8 pr. 2-inch butt hinges for windows.
- 2 doz. sash bolts.
- 24 feet chain for sash adjusters.
- Nails, tacks, paint, etc.

MATERIAL FOR FORTY TRAP-NESTS

Sides and bottoms	$\frac{1}{2}$ x4	230 bd. meas.	Surfaced
Top rails of partition	$\frac{1}{2}$ x2	50 lin. feet.	Surfaced
Top rails of ends	$\frac{1}{2}$ x1 $\frac{1}{2}$	50 lin. feet.	Surfaced
Bottom rails of ends	$\frac{1}{2}$ x3	50 lin. feet.	Surfaced
Side rails of ends	$\frac{1}{2}$ x2	50 lin. feet.	Surfaced
Strips	$\frac{1}{2}$ x $\frac{1}{2}$	80 lin. feet.	Surfaced
Partition strip	$\frac{1}{2}$ x $\frac{1}{2}$	50 lin. feet.	Surfaced
Galvanized iron doors, wire staples, and triggers.			

MATERIALS FOR FOUNDATION AND FLOOR

If a concrete foundation and floor are preferred, the following materials will be required, the joists, girders and flooring as specified in the lumber bills, being omitted.

- 140 sacks of Portland cement.
- 285 cu. ft. of sand.
- 600 cu. ft. of gravel or stone.
- 400 cu. ft. of gravel or broken stone for drainage and insulation.

BREEDING HOUSE FOR MILD CLIMATES

Used On Government Poultry Farm Near Washington, D. C. Suitable for Laying Flocks Where Winters Are Not Too Severe.

By HARRY M. LAMON

(The experimental farm of the Bureau of Animal Industry, U. S. Department of Agriculture, is located at Beltsville, a short distance out of Washington, D. C. Here a liberal tract of land has been set aside for experimental work with poultry, under the capable direction of Harry M. Lamon, head of the Poultry Division. The house here illustrated and described has been in successful use on this farm for several years and also has served as a model for general use in other parts of the country. While the original house is used for breeding pens, the plan is well adapted to the requirements of laying flocks, simply changing width of pens to accommodate flocks of desired size.—Ed.)

This house, known as the "long breeding house," is 180 feet long, 18 feet deep, and is divided into pens nine feet wide. At one end there is a two-story building, 20 feet by 36 feet. The first floor contains an office room and bins for feed. The upper floor has sleeping quarters for the men and rooms for storage. Underneath is an incubator cellar of the same dimensions.

The equipment of this poultry house is extremely simple. The droppings boards are on the north side, two and one-half feet from the floor, and the roosts are about fifteen inches from the wall and eight inches from the droppings boards. The roosts are on hinges and are very convenient to handle when the droppings boards are to be cleaned. Then there is a pen next to the roosts, four feet ten inches deep and three feet wide, for breaking up broody hens. The nests are placed under the droppings boards, are portable and can easily be removed for cleaning and when it is necessary to replenish the nesting material, which, by the way, is attended to often. Great care is taken to clean the nest thoroughly, should an egg become broken in any of them, as soon as the broken egg is discovered. The nest is a great harboring place for mites if it becomes dirty and filthy.

There is a platform two feet by two feet in size and two feet from the floor, for holding the drinking dish. Each

FIG. 115.—FLOOR PLAN OF ONE COMPARTMENT IN BREEDING HOUSE
Reproduced from Farmers' Bulletin 574, U. S. Dept. of Agriculture.

FIG. 116—CROSS SECTION OF BREEDING HOUSE FOR MILD CLIMATES
Reproduced from Farmers' Bul. 574, U. S. Dept. of Agriculture.

pen contains a V-shaped trough for feeding wet mash or other feeds, a hopper on the south wall for the dry mash feed, and about four to six inches of dry straw is kept on the floor. It is intended to put a concrete floor in this house, but up to the present time a dirt floor is being used. There are frames covered with muslin on the inside of the open front, to be let down in stormy weather, and yards 18 feet by 200 feet. Division fences are boarded 30 inches high from the ground with five-foot poultry-proof wire fencing above. It will be noted that this arrangement of yards allows each pen the use of a yard at least every other day, as the pens are 9x18.

The following bill of materials for this house is taken from Farmers' Bulletin No. 574, also the plans shown in Figs. 114, 115, 116 and 118.

BILL OF MATERIALS

Use	Size Inches	No. of Pieces	Length Feet	Board Measure
Sills	2x4	30	12	240 ft.
Plates (double)	2x4	44	12	352 ft.
Ties for rafters	1x5	30	16	220 ft.
Rafters	2x6	56	14	784 ft.
Rafters	2x6	56	10	560 ft.
Studs	2x4	38	12	304 ft.
Studs (front)	2x4	28	8	150 ft.
Roosts	2x3	36	8	144 ft.
Sheathing surfaced one side, for roof				2860 ft.
Matched flooring for walls, partitions, droppings board				3200 ft.
Boards planed both sides for nests				300 ft.
346 running feet of 1x3-inch furring for curtain frames.				
300 sq. ft. of ¾-inch mesh wire netting for front.				
300 sq. ft. 2-inch mesh wire netting for partitions.				
350 sq. ft. of muslin cloth for curtains.				
8 outside doors.				

Prepared roofing paper to cover 2700 sq. ft.
Hardware (hinges, nails, staples, etc.)

FIG. 117—BUILDING BLOCK HOUSE AT IOWA STATE COLLEGE

A BUILDING BLOCK HOUSE Block Houses Are Especially Suitable for Breeding Pens in Cold Climates. Concrete Blocks Can Be Sub- stituted for Tile.

Poultry houses constructed of building blocks are particularly desirable, though somewhat expensive for ordinary use. The dead-air space between inner and outer walls, which is produced by the hollow blocks, makes the house warm in winter and cool in summer, and if properly ventilated it always will be dry. Block houses are easily kept clean and sanitary and afford few harboring places for mites or lice. Nothing but the high cost of building, this way prevents the use of tile blocks in poultry houses of all kinds. When carelessly constructed such houses are not particularly pleasing in appearance, but with careful workmanship they can be made quite attractive, as is the case in the house illustrated in Fig. 117, which is one of the poultry buildings at Iowa State College.

This house is built of tile blocks, but concrete blocks

FIG. 118—FRONT ELEVATION OF BREEDING HOUSE
Reproduced from Farmers' Bulletin 574, U. S. Department
of Agriculture.

can be used where the former are not available. It is 14x100 feet with a plain shed roof and is divided into five pens 14x20 feet each, providing comfortably for a breeding flock from about 40 to 50 hens. If single pens are preferred instead of flock matings, temporary partitions can be used, thus affording accommodations for ten breeding flocks of 15 to 20 fowls. The house is built with a concrete floor, and the general interior arrangement is similar to that shown in other houses in this chapter.

Ventilation is provided by specially constructed windows consisting of narrow sashes arranged in sets of four—three sets for each 20-foot pen. These sashes are balanced on dowel pins turning in holes in the sides of the window casing, and are connected by means of a chain so that by raising and lowering the chain, each set of sashes can be adjusted to uniform position at a single operation, thus providing any degree of ventilation.

CHAPTER VI

Portable Colony and Brooder Houses

The Convenience and Economy of Suitable Portable Houses for Use Either With Adult Flocks, Growing Stock, or Brooder Chicks—How to Secure Substantial, Low-Cost Construction—Plans for Houses Adapted for Use Either in Brooding Chicks or for Laying and Breeding Pens—How to Build Houses in Sections for Easy Moving—Practical Piano-Box Houses, Etc.

HERE are few poultry plants or farms that do not need at least some portable houses. The uses to which they can be put are so numerous that they seldom stand idle for any length of time. While it usually is not practical to keep laying flocks in such houses, owing to the small size of the flocks that can be accommodated, they often can be profitably used for that purpose. They also make ideal quarters for small breeding flocks and are indispensable for brooding chicks, regardless of the method of brooding practiced. After the chicks no longer need artificial heat, the house may be hauled to outlying fields and the growing stock given the complete liberty that is so essential to normal growth and development.

The principal features to keep in mind in building any sort of portable house are that there must be sufficient head room to make the work of caring for the houses convenient; the houses must not be too large to be moved by available means; and, as a rule, they should be provided with double floors, or carefully braced, so that they will not be racked in hauling them about. Moving, especially over uneven ground, puts a severe strain on such structures and they will quickly be pulled apart unless well built.

The material used for sills or runner-sills should be of the most durable timber available; chestnut and cedar are good. White oak, if well seasoned, may be used, but adds to the weight. Throughout the house, light-weight lumber should be used as far as possible. A house built of oak or similar hard wood will weigh a great deal more than one built of white pine. It is not advisable to try to cut down weight by using thin boards or small framing timbers. Such material will not hold up long in a house that is to be moved frequently. Regular $\frac{3}{4}$ -inch boards and 2x4 joists and studs are essential to durability. Where these houses are to be used for laying flocks it is convenient to have the nests on the outside of the building, thus increasing the floor space. Such nests must be carefully built, however, and should be located on the side least exposed to storms, as it is difficult to prevent rain and snow from blowing in. Small, shallow houses necessarily bring the fowls up close to the front when on perches, and special provision must be made to protect them from drafts if open fronts are to be used. With houses of the shed-roof type, such as the colony house shown in Fig. 124, it is practicable to make the window half glass and half muslin shutter, placing the latter above and opening it when necessary to secure proper ventilation, but leaving the glass sash in place except in warm weather.

For moving portable houses a couple of hooks, similar to the one illustrated in Fig. 123, attached to a stout chain 10 or 12 feet long, are most convenient. Make the hook of $\frac{5}{8}$ or $\frac{3}{4}$ -inch iron, with the hook part about four inches long, and pointing forward a little, rather than with a square or right-angled turn. If this is done it will not be so liable to slip out of the hole in the runner under a heavy strain. In England, where portable houses are extensively used, small wheels are often employed in place of runners.

A GABLE ROOF PORTABLE HOUSE

Will Accommodate Twenty-Five to Thirty Hens, or May Be Used for Lamp-Heated and Colony Hovers.

The house illustrated in Figs. 119, 120, 121, and 122 was designed at the Pennsylvania Agricultural College and has been in use there for some years. It offers a practical solution of the problem of building a house that will meet the requirements of both brooding and laying house. It is about as large as can be moved by one team, requires a minimum of lumber for the floor space enclosed and gives plenty of head room without high walls. If the house is to be used for a colony hover the front window at the end opposite the door can be omitted, but where lamp-heated

FIG. 119—A GABLE ROOF PORTABLE HOUSE

hovers are to be used, as illustrated in Fig. 121, the original arrangement is better, as it gives more even distribution of light.

This house is regularly built with flooring boards or car siding for the sides and with a double floor, as shown in Fig. 14. Rafters are provided in the bill of material, but the original houses were built without rafters, the roof boards being run up and down and nailed securely together at the ridges, which construction is firm enough for all practical purposes.

Fig. 122 shows floor plan as arranged for winter use of the laying or breeding flock. The floor is laid on 3x6-inch chestnut runners, with four 2x4-inch joists mortised into the top of the sills and firmly spiked. Fig. 121 shows a cross section with lamp-heated hover installed. Three such hovers can be accommodated in one of these houses, temporary partitions being placed between them, to be removed when the chicks are ready to go on perches. This house provides excellent quarters for a colony hover flock, the hover being placed back within about two feet of the end wall. Fig. 120 is a cross section with perches and platform installed. Fig. 119 shows the completed house on the range. For summer ventilation a small louvered opening

FIG. 120—CROSS SECTION OF GABLE ROOF HOUSE WITH PERCHES AND NESTS

(not shown in plan) should be provided in each gable. If built of white pine or similar light-weight lumber, a two-horse team will readily haul this house anywhere on reasonably level ground. The sills are rounded off at each end, runner-fashion, and suitably bored for attaching hooks or chain to hitch to.

BILL OF MATERIALS FOR PORTABLE HOUSE

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills	3x6	14	2	
Jolts	2x4	8	6	
Plates	2x4	12	2	
Studs	2x4	10	10	
Rafters	2x4	10	6	1 piece cuts 2
Perches	2x4	12	2	1 piece cuts 2
Support for drop. plat.	2x4	12	1	
Sheathing boards for subfloor, roof, nests and partitions	3/4x10	300 ft. bd. meas.		Surfaced.
Matched flooring for floors and drop-pings platform	3/4x4	415 ft. bd. meas.		
Furring	3/4x3	125 lin. ft.		Surfaced.
Window sills	1 1/2x5	8 lin. ft.		Surfaced.

FIG. 121—CROSS SECTION OF GABLE ROOF HOUSE WITH BROODING HOVER

MATERIAL FOR NESTS

Door	7/8x7	5	1	Surfaced
Front base	7/8x6	5	1	Surfaced
Bottom	7/8x12	5	1	Surfaced
Rear base	7/8x4	5	1	Surfaced
Top strips	7/8x2	10	1	Surfaced
Upright	2x4	6	1	Surfaced
Brackets	7/8x4	8	1	Surfaced

- 1 1/2 rolls of prepared roofing.
- 100 sq. ft. sheathing paper.
- 2 6-light window sashes, 10x12-inch glass.
- 10 1/2 sq. ft. muslin.
- 23 sq. ft. 1-inch mesh poultry netting for windows, etc.
- 1 pair 8-inch strap hinges for outside door.
- 1 6-inch hasp.
- 3 pairs 2-inch hinges for windows and shutters.
- 1 pair 4-inch strap hinges for perch supports.
- 1 pair 3-inch strap hinges for nests.
- 4 hooks and eyes.
- 2 chain sash adjusters.
- Nails, tacks, paint, etc.

FIG. 122—FLOOR PLAN OF GABLE ROOF HOUSE

SLED RUNNER COLONY HOUSE

Being Eleven Feet Deep and Only Seven Feet Wide, the Rear is Comfortable and Always Free From Drafts.

By J. W. PARKS

We have been for a number of years working on a colony house that would not only answer the purpose of raising the chicks, but one that we could fix up at very small cost for winter use. Furthermore, we wanted a house that we could change from a summer to a winter house with a very small expenditure of time, because when one has a great many houses to care for, things must be pretty convenient, as time is one of the most important considerations. These features our colony houses have.

These houses are 7 feet wide and 11 feet deep, 7 feet high in front and 5 1/2 at back. We like these narrow, deep houses much better than houses more nearly square, as they hold the heat better in winter, and fowls, when on the perches, are further away from the open front.

In constructing this house three sled-runners are provided for the back, middle and front. As our houses are to be used on land sloping to the east, we make the front runner 8 inches high, the middle one 6 inches, and the back one 4 inches, which helps to take care of the slope without having to block up the house, and avoids having the litter all work toward the front. Next we cut 2x4's, as long as we intend the house to be deep, placing one at each side and one in the middle, notching the runner, so that the 2x4's rest level with the top of the runners. In this way we get a level surface on which to lay the first floor, which must be of tongue-and-groove lumber. Over this sub-

FIG. 123. HOOK FOR MOVING HOUSES

floor lay some old papers and then a second floor of boards. We find these double floors very helpful in keeping the house warm in cold weather.

Next, the frame is set up and the corner boards nailed on, and then we finish boarding up, using matched lumber so as to have tight joints. There must be no drafts in these coops. These houses can be built at com-

they quickly learn to spread out lengthwise. The first few nights we place them under this hover until they learn to perch on these, then we gradually raise them up higher.

SECTIONAL COLONY HOUSE

Built in Five Conveniently Handled Sections. Can Easily Be Set Up or Taken Apart for Moving.

A poultry house built in sections, so that it may be taken down for moving and readily reassembled in a new location, often is desirable, especially for the use of persons who do not own their own homes and who are compelled to move more or less frequently. To meet this requirement the Storrs (Conn.) Agricultural College has designed the house illustrated in Figs. 125, 126, 127, and 128. The following description is given in a circular issued by the Department of Extension Service of this institution:

"Building in sections and putting together is a type of construction which requires a minimum amount of material and no extra labor. The demonstration house here described was built by an amateur carpenter in fifteen hours' time. The following bill of material was used:

Best roofers—200 ft., 14 ft. x 1x6 in.	\$7.60
Sills and studs—4 pieces, 12 ft. x 2x3 in.	1.08
Furring—9 pieces, 12 ft. x 1x2 in.	.81
Window—1, 3-light 9x13 in.	.50
Wire—8 feet 1-inch mesh, 2 feet wide	.40
Unbleached sheeting—1 yard, 42 inches wide	.25
Hinges—2 pairs, 4 inch T hinges	.28
Hooks and eyes—15	.26
Nails—5 lbs., 6p	.40
Nails—3 lbs., 8p	.24
Screws—1 dozen, 1½ inch	.65
Roofing paper—½ roll	1.00
Total cost	\$12.88

"The accompanying plans are somewhat different from the ordinary house plan in that each section is shown as it appears when completed, lying outside down, before putting together. The best boards should be

paratively moderate cost and may be used either for adult fowls, for indoor brooders or hovers, or can be arranged for cold brooders when the chicks are no longer in need of artificial heat. We have two muslin sashes to fit into the windows or openings, which we use in winter. The bottom sash is put in permanently and the top one slides up and down. For ordinary winter weather we leave the top sash down, but when it is extremely cold we generally have the top sash half-way up, leaving a portion still open. However, the matter of ventilation depends upon the number of fowls in the house.

We have a sort of a bale hook that we hook under the house back of the 2x4 on the side, and then attach the other end to a singletree, and the team readily moves it to any desirable location. In the summertime we move these houses not less than twice a month, even if it is only the length of the house, as that gives the chicks new pasture and prevents killing the grass under the house.

It may be of interest to describe the cold hovers that we use in these houses. Each house is equipped with two roost poles, 2x3 inches, with rounded edges, for adult fowls. When the house is to be used for chicks we rest these poles on temporary strips on each side of the wall, placing them so that the poles will be about 6 inches from the floor. The back pole is 8 inches from the rear wall and the other about 1 foot in front of it. Over these we tack empty burlap sacks, laying them across the poles and letting them hang down, front and back, with the ends about 2 inches above the floor. We place about an inch of chaff on the floor and in cold weather often throw a lot of chaff on top of the sacks to keep in the warmth. If the chicks get to crowding under this hover they soon are exposed to the cold either in front or back, and so

FIG. 124—SLED RUNNER COLONY HOUSE
Photo from J. W. Parks.

FIG. 125—FRONT OF SECTIONAL POULTRY HOUSE
From blue print furnished by Storrs (Conn.)
Agricultural College.

chosen for the side walls, which may be made tight by painting. Do not neglect painting, as such lumber will not stand the weather. Boards which are not perfectly tight may be used for the roof, as it is covered with roofing paper. The cloth curtain in front, which is 32x39 inches, outside measurement, slides up and down outside

FIG. 126—EAST END OF SECTIONAL POULTRY HOUSE
From blue print furnished by Storrs (Conn.)
Agricultural College.

FIG. 128—WEST END OF SECTIONAL POULTRY HOUSE
From blue print furnished by Storrs (Conn.)
Agricultural College.

and may be fastened in any position with the hook, which is turned into the top. The window on the end swings out and may be held open at any angle by the button on the casing. The droppings board, which is 6 feet long and 21 inches wide, rests on cleats which are provided on each end section. The feeding board for mash hopper and water dish is 21 inches long and 16 inches wide, and is located under the window. It is supported by the droppings board on one end, and a brace running down to the sill on the other. The nests are simply a long box without partitions, 12 inches high, 12 inches wide, and 4 feet long, supported by a cleat on the brace under the feeding platform on one end and a cleat on the back wall on the other end. Hooks and eyes or screws are used to fasten the corners of the house together and hold the roof in place. Nails may be used if the house is not to be taken apart and moved. No floor is provided as this is not considered necessary under average conditions.

AN ATTRACTIVE PIANO BOX HOUSE

Made From Two Piano Boxes. Is Practical, Comfortable and Inexpensive.

By HARRY B. PHIPPS

Inexpensive poultry houses may readily be made from piano boxes. The substantial one shown in Fig. 132 is a good example of a house of this type, and it can be

FIG. 127—BACK OF SECTIONAL POULTRY HOUSE
From blue print furnished by Storrs (Conn.)
Agricultural College.

FIG. 129—ROOF OF SECTIONAL POULTRY HOUSE
From blue print furnished by Storrs (Conn.)
Agricultural College.

built with comparatively little work. It is made by removing the backs and tops of two piano boxes and placing them together, back to back, on a substantial foundation.

Two pieces, 6 inches wide and 20 inches long, are fastened to the top of both boxes, to give pitch to the roof. The two boxes are to be fastened together with upright strips, 4 inches wide and 4 feet 6 inches long. If it is desired to make the house portable, use screws instead of nails for the purpose. A door 4 feet 6 inches high and 16 inches wide is cut out of the end of one of the boxes and a yard door for the fowls near one corner.

Nail a 2 or 3-inch strip around the edge of the roof to give a projection and then nail on the roof boards and cover them with prepared roofing. The window in the

FIG. 130—A LOW-COST PIANO BOX COOP

front of the building contains four 8x10-inch panes of glass and there is a ventilating opening in the gable provided with an 8x10-inch pane, which slides in suitable grooves, providing additional ventilation when required. The bars across the window are made from old buggy tires and are a desirable addition where there is danger of the fowls being molested by thieves.

In this house the perch is located along the wall, opposite the window, and a suitable droppings board about 2 feet wide should be provided. The nests may be cheaply made and may be suspended from the front edge to the droppings board, which should be high enough to allow the fowls the free use of the entire floor. There will be sufficient lumber from the backs of the boxes to make the droppings board, window cases and a little screen over the exit door, etc.

The only materials required in building this house, aside from the two piano boxes, are the window glass, roofing, one pair of hinges, one hasp and a little paint.

LOW COST PIANO BOX COOP

The house shown in Fig. 130 has a floor space of approximately 30 square feet and was made from a single piano box. The back of the box forms the floor. The front was removed and the sides filled in on the line of the slope of the top part of the front, thus giving a plain shed roof. The roof boards were nailed to battens and hinged at the front so that the entire roof could be

raised for cleaning, etc. In the ordinary care of fowls, access to the interior is secured through the 2½x3-ft. opening, which is protected with double screens, one covered with netting and the other with muslin.

COMBINED PORTABLE HOUSE AND RUN

An Easily-Moved Coop For a Small Flock of Confined Fowls or Chicks.

The combined coop and run illustrated in Fig. 131 is one of several in successful use on an eastern backyard poultry plant. This house is only about 4 feet square, but is expected to accommodate 12 fowls. While this crowds them to an unusual extent the owner reports good winter egg yields notwithstanding this. As will be seen, canvas is tacked to the north side of the run to cut off the cold winds which come from this quarter, and the house is provided with a hinged, muslin-covered frame on the south side, which affords some light and

FIG. 132—AN ATTRACTIVE PIANO BOX POULTRY HOUSE

ventilation when closed, and which can be left open when the weather is mild. In the early summer these houses and runs are used for brood coops, the chicks being transferred to them as soon as they no longer need artificial heat.

The advantage of a house of this sort is that it may readily be transferred, run and all, to new ground. When the pens are located on a good grass sod they can be shifted every few days to a new location, thus providing an abundance of green food without allowing the fowls to remain long enough in any one place to kill out the grass. For a small flock it is possible to build a house and outdoor run in this way at lower cost, probably, than in any other way. The floor of the house is about 2 ft. above the ground, or on a level with the top of the run. This provides a sheltered space underneath, from which the fowls reach the upper floor, where perches and nests are located, by means of an incline.

FIG. 131—COMBINATION COOP AND YARD

CHAPTER VII

Permanent Brooder Houses .....	70

Every Farm or Poultry Plant Where Early Hatched Chicks Are Raised Should Have a Permanent, Conveniently Arranged Brooder House—Merits of Different Brooder Systems Briefly Compared—Plans for Practical Lamp-Heated Hovers With or Without Auxiliary Heat—Hot Water Brooding Systems—One and Two-Compartment Houses for Colony Hovers.

OIL and coal-burning colony hovers, each one capable of brooding a single flock of several hundred chicks, have largely supplanted lamp-heated hovers and hot-water pipe brooding systems in popular favor. They possess the important advantage of low cost for installation and operation and adaptability to use almost anywhere indoors, and they effect a great saving in labor on account of the very large flocks they are able to brood successfully. Nevertheless, it is well to bear in mind the fact that there still are conditions under which other methods of brooding will be found desirable.

Where the chicks are to be raised in large numbers and in moderate weather, colony hovers unquestionably offer the most economical means now known for doing this. Under ordinary circumstances, however, it is not claimed that the chicks raised in flocks of 300 to 600 each will be as well developed as when brooded in smaller flocks under a good-sized lamp-heated hover accommodating 75 to 100 each. Also, in extreme winter weather poultry keepers generally believe that they cannot raise chicks under colony hovers as satisfactorily as in regular pipe-heated brooder houses.

Plans for various types of brooder houses are provided in this book, and the poultry grower is earnestly advised to consider carefully just what his real needs are in the way of brooding facilities before deciding on the equipment to be purchased. If broilers or ordinary commercial or farm flocks are to be raised, no doubt the colony hover will meet most requirements, though there are few poultry plants that will not find it good economy

to have a few lamp-heated hovers on hand to meet the various emergencies that are liable to arise wherever chicks are brooded.

Where chicks are to be raised on a small scale, or where small incubators are in use and the broods consequently are small and of different ages, nothing will take the place of good lamp-heated hovers. The plan of providing partitions, with the idea of brooding two or more flocks under one colony hover, is only partially satisfactory, especially when the flocks are of different ages. In this case either the hover will be too warm for the older chicks or it will be too cold for the younger; either way heavy losses are liable to result.

Where chicks are to be raised for breeding stock, it is highly important that they be given the best possible conditions for growth and development, and it seldom is advisable to brood such stock in colony hovers. It is much better to go to the additional expense of brooding them in small flocks under lamp-heated hovers and thus make sure of giving the individual chicks the best possible chance.

For winter brooding, pipe-heated brooder houses are still regarded as indispensable by many poultrymen. Pipe-heated systems, properly installed, provide plenty of heat without great extremes in different parts of the brooding chamber, floor drafts are reduced to a minimum, and valuable chicks may thus be given highly favorable conditions for growth and development at this most difficult season for successful brooding.

The reader must determine for himself just what method or combination of methods will meet his condi-

FIG. 133—FLOOR PLAN OF PERMANENT BROODER HOUSE

FIG. 134—FRONT ELEVATION OF PERMANENT BROODER HOUSE

tions, bearing in mind, however, that he can better afford to employ inadequate facilities and makeshift equipment at any other point than in the brooding of his chicks.

BROODER HOUSE FOR LAMP-HEATED HOVERS

May Be Built With or Without Auxiliary Heat.

Brooding With Lamp-Heated Hovers is
Practical With the Right Kind
of House.

The floor dimensions of the brooder house shown in Figs. 133 to 141 inclusive, are 16x30 feet. It can, of course, be built any length, but under ordinary conditions

FIG. 135—END ELEVATION OF PERMANENT BROODER HOUSE

a width of 16 feet is most satisfactory and should be maintained, regardless of length.

There are few poultry plants where such a house as this will not be found a profitable part of the equipment, making it possible to brood chicks successfully at almost any season and under the most favorable conditions. Even where colony hovers are depended on for brooding the bulk of the young chicks, a small, well-equipped brooder house of this sort, for use in brooding small flocks and special-quality stock, will soon pay for itself.

The foundation should be six-inch concrete walls and these should extend six inches above the ground level. The foundation should be carried down to the frost line or to solid ground—18 to 24 inches as a rule.

Earth floors are not practical for brooding houses where rats are common, as these pests like nothing better than young chicks, and can be

depended upon to get them eventually, even though the entire floor is carefully screened with netting. Board floors are open to the objection that they are colder and also harbor rats unless raised well off the ground, which necessitates long inclines for the chicks.

Generally speaking, therefore, concrete floors are most suitable, though they must be thoroughly insulated and kept covered with coarse sand or deep litter to avoid injury to the chicks confined in them. For brooder

house floors of concrete, cinders are recommended, as this material makes a warmer floor than either stone or gravel. By cinders are meant the coarse ashes from large furnaces and boilers. Ordinary fine ashes from stoves and furnaces will not do, and if there is much of this material in the cinders it should be sifted or washed out.

If a board floor is preferred, it should be laid double, with sheathing paper between, also one-inch poultry netting which will make it impossible for rats to gnaw through. Bear in mind, however, that if rats succeed in establishing themselves underneath the house, it will be only a matter of time until they will succeed in getting at the chicks, no matter how carefully they are protected.

Houses that are to be used in cold weather should always be ceiled. The additional cost of doing this will be amply repaid by the smaller amount of fuel required. Lath and plaster may be used if preferred, but, under ordinary conditions, ceiling is much better suited to poultry-house construction. Building paper should always be tacked to the studs before siding or ceiling is put in place. A layer of sheathing paper should also be nailed to the lower side of the ceiling joists or rafter ties before the ceiling is nailed on. Ventilation openings should be provided in the ceiling, as shown in Fig. 141, page 73. In small houses it is sufficient to have louvered ventilators in each gable, but in houses 50 feet or more in length it is necessary to provide roof ventilators also.

The ground should be graded up to the front sill so that the chicks will have easy access to the yards. The siding should be carried up close to the roof boards, notching the top board carefully for the rafters. For cold climates, storm doors for all outside doors are advisable.

FIG. 136—CROSS SECTION OF PERMANENT BROODER HOUSE

Pipe-heated hovers are not recommended in small brooder houses, as better results usually are secured at less expense where the pens are equipped with individual lamp-heated hovers. In houses 50 feet long and upwards, pipe-heated hovers may be found more economical, though many chick growers prefer individual hovers in brooder houses of any length. Where chicks are to be brooded in

for auxiliary heat should be placed along the north side and as low as the size of the heater will permit, but it is not necessary to place the heater in a pit, as there is no disadvantage in having the pipes well up on the wall, so long as they are not above the rear windows.

Fig. 133 shows floor plan, with six hovers, each capable of accommodating about 100 chicks. The number of pens may be reduced to five if preferred, and made five feet wide, which is a more convenient width for the caretaker. The heater is located at the farther end, where it is out of the way but easily cared for. A heater with a 12-inch grate should provide ample heat for a house of this size. Do not make the mistake of keeping the house too warm; 60 to 65 degrees is warm enough, as a rule. The individual hovers can be depended upon to provide the necessary additional heat without at any time having the lamps turned dangerously high.

Fig. 136 shows a cross section indicating adjustment of windows, etc., also construction of partitions. These are to be built up of flooring or any other tongue-and-groove lumber, to a height of 21 inches above the brooder house floor, with three-foot wire netting above. Note location of ceiling ventilator and see Fig. 141 for detail drawing. Figs. 134 and 135 show elevation of front and end respectively.

Fig. 140 is an enlarged drawing of a pen front. Note that the first eight inches is occupied by the joist carrying the hover floor. The hover floor is set back one inch from face of joist and the space from top of joist to bottom of pen door is boarded up with matched flooring, or with a nine-inch surfaced board if desired. The doors, which are 2x3 feet, have 1x3-inch frames, with one-inch mesh poultry netting tacked on with double-pointed tacks, so that there will be no loose ends to catch clothing. The studs on either side of the door are 2x2 inches and the

FIG. 138—CONSTRUCTION OF HOVER FLOOR IN BROODER HOUSE

Where the brooding pens are five feet wide or more, it is desirable to have the pen doors hung on double-acting spring hinges, but this cannot be done with four-foot pens, as in these narrow pens the door cannot swing in without striking the hover.

Fig. 139 is a detail drawing of chick door and window construction. Both door and window are to be framed, the window closing against a $\frac{1}{2}$ -inch weather strip. This strip is cut short at the bottom to allow the bottom of the window to swing out when opened, the window being hinged to the sill, as shown. A short length of chain attached to the sash with a screw eye and dropping over a hook in the casing above, affords a convenient means of adjusting the window at any angle. A spring window bolt may be used to hold the window when closed. The chick door slides up and is held open with hook and eye. The window sill may be of plain, two-inch stuff, placed at an angle, if desired; but it is easier and better to have a milled sill, spiking it flat to the undersill, as shown. The chick door sill may be sloped, if desired, but there is no real necessity for doing so and construction is simpler as indicated. The outside doors are framed, as shown in Fig. 26 on page 19. The ventilator door, shown in Fig. 141, is hung flush with the lower face of the ceiling, making the opening wide enough so that the door will swing freely. It may be conveniently swung on a $\frac{1}{4}$ -inch iron rod, stapling it

FIG. 139—DETAILS OF WINDOW CONSTRUCTION

FIG. 140—PEN FRONT IN BROODER HOUSE

tightly to the door and letting it turn in staples driven into the ceiling on each side. This rod should be stapled to the door just enough off center so that it will swing shut when not fastened open. A couple of small blocks, nailed to the upper side of the ceiling at either end of the door, act as stops. The door may be held open by a weight, or by attaching the cord to stud or partition. These doors should be approximately under the highest point in the roof, providing two in this 30-foot house and spacing them 20 feet apart in long houses.

partitions are nailed to them. The studs are faced with $1 \times 1\frac{1}{2}$ -inch strips and spaced $23\frac{1}{2}$ inches apart, so that the door will swing shut against the face of the stud. The rest of the front not occupied by the doors is finished with three-inch strips and one-inch netting, same as doors.

DETAIL OF CEILING VENTILATION

Scale: 1" = 1'-0"

FIG. 141—CEILING VENTILATOR FOR BROODER HOUSE

Fig. 138 shows the construction of hover floor, runway and finish of passageway partition.

BILL OF MATERIALS FOR 16x30 FOOT BROODER HOUSE

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, side	2x4	16	4	
Sills, ends	2x4	16	2	
Joists for hover plat.	2x4	12	6	
Plates	2x4	16	4	
Studs, front	2x4	10	9	1 piece cuts 2
Studs, rear	2x4	12	8	1 piece cuts 2
Studs, ends and misc.	2x4	12	12	
Studs, partition	2x2	12	10	1 piece cuts 2
Rafters	2x6	14	16	
Rafters	2x6	12	8	1 piece cuts 2
Ties for rafters	2x4	12	15	
Braces for rafters	1x6	8	15	
Sheathing for roof			660 ft. bd. meas.	Sfcd.
T & G siding			625 ft. bd. meas.	
Matched flooring for hover platform, partitions, etc.			260 ft. bd. meas.	
5/8-inch ceiling boards for walls and ceiling			1250 ft. bd. meas.	
3/4x6-inch boards for ridge pole, door and window frames			125 lin. feet.	Surfaced
Trim lumber, ventilators, etc.	3/4x4		430 lin. feet.	Surfaced
Door and window sills	2x8		40 lin. feet.	Milled.
Strips for inside window sills, and facing for front partition			75 lin. feet.	
studs	3/4x1 1/2			
Strips for window stops			150 lin. feet.	Surfaced
and chick runway	1/2x1		30 lin. feet.	Surfaced
Drip cap				

6 squares prepared roofing.
12 squares building paper.
266 sq. ft. 1-inch mesh poultry netting for windows.

FIG. 142—FLOOR PLAN OF PIPE HEATED BROODER HOUSE IN USE AT MASSACHUSETTS AGRIC. COLLEGE

- 11 sashes, 1 1/2-inch, 4-light, 10x12-inch glass.
- 1 4-panel door.
- 1 pr. 4-inch butt hinges.
- 1 rim lock.
- 6 pr. 3-inch butt hinges for partition doors.
- 11 pr. 2-inch butt hinges for windows.
- 18 2-inch screw hooks and eyes.
- 14 ft. of sash chain.
- 6 anchor bolts 3/4x12in., with 2-in. washers for each end.
- 2 iron rods, 1/2x20-inch, for swinging ventilator doors in ceiling.
- 1 6-inch chimney thimble.
- 350 bricks for chimney.

MATERIALS FOR CONCRETE FLOOR

- 50 bags of cement.
- 120 cu. ft. sand.
- 200 cu. ft. cinders or crushed stone.
- 160 cu. ft. cinders or stone for filling.

EQUIPMENT

- Water boiler, 12-inch grate.
- 5 gal. expansion tank.
- 6 feet of 2-inch pipe.
- 100 feet of 1 1/2-inch pipe.
- Necessary manifolds, unions, elbows, etc.
- 4 wall brackets for supporting pipe.
- 2 joints of 6-inch stove pipe.
- 2 stove pipe elbows.
- 6 lamp-heated hovers, complete.

MASSACHUSETTS OPEN PIPE BROODER HOUSE

A Popular Type of Brooder House for Extra Early Chicks. Used Quite Generally in New England. Hot Water Pipes Not Enclosed.

By PROF. J. C. GRAHAM

(A type of hot-water pipe brooding house in general use in New England, where it has given excellent results for many years, is known as the open-pipe system. One of the most modern and best planned houses of this kind is the one designed and in use at the Massachusetts Agricultural College, which is described by Prof. Graham as follows. This house is illustrated in Figs. 142 and 143.—Ed.)

This house is designed for early or winter brooding by people who wish to brood in large numbers. It is 14x72 feet. Twelve feet at one end is used for the pit, furnace, coal, etc. The other 60 feet are divided into 12 pens, each five feet wide, as shown in detail in Fig. . It is heated by hot water, the pipes running parallel with the floor. The floor has a fall of 15 inches toward the pit. This gives a good chance for flow and return. The walls, both front and rear, are 6 1/2 feet high.

The house is lathed and plastered on the inside with wood pulp plaster. This gives a very hard, smooth finish and is about as cheap a method of construction as one can use for a good finished piece of work. In the ceiling there are three openings, each about 15x24 feet. These are for ventilation particularly. Over these are placed burlap screens or small doors.

As can be seen, it has a good cement foundation and

cement floor. Novelty siding is nailed on the outside of the studs. There is no double boarding on the inside. This building cost about \$1050 and has given good satisfaction.

Note that the only hover we have is a burlap screen. This is laid over about one-half of the space between partitions, therefore it is about $2\frac{1}{2}$ feet square. After the first few days it is removed. We also have a board about 12 inches high to keep the chicks within about two feet of the pipes for the first 24 to 48 hours. It is then moved back to about the middle of the run for another day or two, and finally removed, giving the chicks the use of the entire run.

The pit is $4\frac{1}{2}$ feet deep. If possible, it would be well to have a drain in this pit. In cold weather the water could be run off easily without carrying it out. Furthermore, in cleaning a brooder house the work should be done thoroughly, and by the use of a hose the floor could be flooded and the water carried away by this drain. Of course, it may not be convenient to do this, but in case it is it will be well to provide for it.

There are eight $1\frac{1}{4}$ -inch pipes $5\frac{1}{4}$ inches from the

FIG. 143—PIPE HEATED BROODER HOUSE AT MASS. AGRI. COLLEGE

rear and four inches apart on centers. The pipes are seven inches from the floor, but it would be just as well to drop them one inch, making the distance from the pipes to the floor six inches instead of seven inches.

Each hover will take care of 100 chicks, although we believe better results follow when the number is reduced to 50 or 75.

BILL OF MATERIALS FOR PIPE-HEATED BROODER

HOUSE				
Use	Pieces	Size	Length	Board Meas.
Studs, sides	37	2x4	13 ft.	333
Studs, ends	2	2x4	18 ft.	444
Rafters	37	2x4	18 ft.	24
Sills	2	2x4	14 ft.	18
Sills	8	2x4	18 ft.	96
Plates	8	2x4	18 ft.	96
Girders	35	2x3	14 ft.	245
Headers	7	2x4	12 ft.	56
Posts for partition	6	2x3	10 ft.	30
Post for railing	1	2x4	3 ft.	2
Plant for bin	2	2x9	14 ft.	42
			Total.....	1386
Novelty siding (front and rear 982) (ends and rear 282)				1264
Roof boards				500
Partition				187
Shingles				$9\frac{1}{2}$ M.
Lath and plaster				105 sq. yd.
Concrete foundation				$18\frac{1}{4}$ sq. yd.
Concrete floor				936 sq. ft.
Partitions, wire				200 sq. ft.
Doors—2.				
Windows—12.				
Heater.				
Hardware.				
Chimney.				

PIPE HEATED BROODER HOUSE WITH UNDER-

NEATH HEATING SYSTEM

Practical House for Cold Weather Brooding. Pipes Under Brooder Floor. Hover Warmed By Gentle Current of Hot Air.

Pipe-heated brooding systems with enclosed pipes have been in use for many years and have given varying degrees of satisfaction. A serious objection to this method of brooding is that, as such heating systems usually are installed, there is not a sufficient ventilation under the hovers. In order to provide the better air circulation needed, the pipes may be placed below the hover floor and enclosed in a chamber or long narrow box where air can be heated, after which it is discharged under the hover, thus maintaining a constant air circulation which automatically ventilates the hover space. Plans for a house heated in this manner are illustrated in Fig. 144. The house here shown is 140 feet long and 13 feet wide, and is separated into two parts, 36 feet and 104 feet, respectively. The short end has 12 pens of 3 feet each in width and 10 feet in length, including the hover, and the longer end has 24 pens 4 by 10 feet in size. The furnace pit and a narrow walk separate the two lots of pens, and an aisle 3 feet in width extends the entire length of the house back of the hovers.

The system of heating pipes is installed under the hover floor in a concreted trench. The shorter end has a 2-inch flow and return pipe. The long end has two flow and two return $1\frac{1}{2}$ -inch pipes, and both sides are controlled by valves near the heat whereby all or a part of the flow may be shut off from the pipes. The trench is made by excavating to a depth of 6 inches and 36 inches wide. The sides and bottom are cemented and the top is boarded with a course of rough 1-inch boards, covered with a layer of matched $\frac{3}{8}$ -inch spruce flooring (K). This double boarding prevents any danger of too much bottom heat. The boarding comes flush with the edges of the trench sides, and the frame work of the hovers is of 1x3-inch posts which are only as high as the hover divisions (C), which in the small pens are 10 inches and in the large pens 12 inches.

This gives a house entirely free from inside posts and makes possible a view of the whole interior from any part. The hover floor is 3 feet wide (the width of the trench) and in the 3-foot pens the hover top slides on cleat (F) 6 inches from the floor. The top or cover is only 24 inches wide, which leaves 12 inches of the slightly warm floor in front of the hover curtain, making a splendid resting place for the little chicks or ducklings, which they evidently enjoy. When first they are put in the hover, they are penned back nearly to this floor and the gentle warmth helps them and keeps the floor free from dampness. The cover being in two parts (A and B) and sliding freely on cleats (F), may readily be adjusted so as to give ventilation at the back, front or center of the hover, or all three, and the surplus heat may escape in the same way.

The hover floor is kept littered with chaff or shavings and when the pen is to be cleaned, the hover top is removed, the back board, which sets between cleats, is

FIG. 144--PLANS FOR PIPE HEATED BROODER HOUSE WITH PIPES UNDER FLOOR

This illustration shows part of front elevation, cross section, floor plan, and isometric view of hover. See accompanying text for key to letters used in isometric, and for general description.

taken out and the litter swept into the aisle and taken away in barrels. When the little chicks are to be changed from pen to pen, the back boards are taken out and they are driven down the aisles from one pen to another. In the long end of the house these are 4 feet wide and the hover 8 inches high, but otherwise are the same as the short end. The illustration shows a hover closed, one with the top partly cut away and one with the top off and the back out, ready for cleaning.

The hot air is admitted to the hovers through the upright $1\frac{1}{4}$ -inch pipes seen in the lower floor. These pipes reach nearly to the underside of the house and the lower ends just reach through the board floor, being flush with the under side. Back of each second hover (on the division post, so as to be out of the way) is a 2x3 air box which reaches down under the side and permits the cold air to enter the trench. This gives a chance for the warm air in the trench to rise through the short, upright pipes under the hover while cold air is drawing from the aisle, making a perfect circulation. The warm air strikes the hover and, deflecting, makes the entire hover space warm, but does not expose the chick to drafts or to direct heat. The sliding two-piece hover-top permits of ventilation and the escape of surplus heat at the will of the operator. For the older chicks no curtain is supplied for the hover front, which is left entirely open.

MATERIALS REQUIRED FOR 100-FOOT HOUSE

Sills, 12 pieces, 3 by 4, 18 feet; 2 pieces, 3 by 4, 14 feet.
Plates, 12 pieces, 2 by 4, 18 feet; 2 pieces, 2 by 4, 14 feet.
Studs, (10 feet to centers), 11 pieces, 2 by 4, 6 feet 3 inches;
30 pieces, 2 by 3, 4 feet 7 inches.
Girts, 10 pieces, 2 by 3, 12 feet.
Rafters, 51 pieces, 2 by 4, 16 feet.
Extra for slides, door frames, etc., 8 pieces, 2 by 3, 16 feet.
Rafter ties, 49 pieces, 1 by 6, 7 feet.
Boards, outside, 700 feet 14-feet; 2300 feet 16-feet; inside, 524 feet; total, plain, 3524 feet; matched, 900; if celled inside add 2400 feet.

Board up and down, roof lengthwise.
Paper, roof, 1500 feet; balance 1400 feet.
Doors, three 3 by 6 feet 6 inches, one 2 by 5.
Wire netting to suit use, 1-inch mesh.

HOVER WORK

Sills, 12 pieces, 2 by 6, 16 feet.
Floor, 300 feet, 12 feet.
Covers, divisions and back, matched 500 feet, 12 feet.
Pen division boards, 14 pieces, 1 by 12, 16 feet.
Windows, 14 12-light, 9 by 13; 6 rear windows 6-light, 9 by 13; 2 end windows, 6-light, 9 by 13.
Cement floor under all, 1300 feet.
Pit wall 18 inches, 5 by 8 feet, 5 feet deep, pointed.
Walk across pit and stairs, 5 pieces, 2 by 6, 16 feet.
Heating and piping to suit.

COMBINATION HOT WATER AND COLONY HOVER BROODER HOUSE

Front Section Heated By Hot Water Pipes Underneath Floor. Rear Section Accommodates Several Colony Hovers.

The semi-monitor roof brooder house, shown in Fig. 145, was designed by J. W. Parks, the well-known breeder of Barred Plymouth Rocks, after a careful study of brooder-house construction in general and his own special requirements in particular. It has been in use on his poultry plant for the past few years with complete success. It is unique in brooder-house construction in that it utilizes both the hot water and colony hover brooding systems, one helping out the other to some extent and thus, it is believed, getting the best results from each.

The house is 65 feet long and 28 feet wide. Both front and rear walls are five feet high from sills to eaves and the front of the rear section is 11 feet high. The house is divided lengthwise in the center, the front part being equipped with a water boiler and a coil of heating pipes. A space about 5x10 feet is occupied by the boiler and coal bin, the boiler standing in a three-foot pit. The outside

FIG. 145—COMBINATION PIPE HEATED AND COLONY HOVER
BROODING HOUSE

Photo furnished by J. W. Parks.

door opens into a passageway $3\frac{1}{4}$ feet wide and sunk so that the floor is three feet below the main floor of the house. The coil of hot water pipes, consisting of six lines of $1\frac{1}{4}$ -inch pipe, is enclosed in a wooden box underneath the floor of the house. Each compartment is provided with a hover, which is heated by means of warmed air, which is admitted from the pipe box to the hover chamber through hot air flues suitably located in the floor under the hover. This part of the house is divided into 15 pens, each four feet wide and having a normal brooding capacity of about 100 chicks, or 1,500 in all.

The back part of the house, which is separated from the front by an open partition of wire and boards, is divided into five compartments, each equipped with a coal-burning colony hover. In cold weather, with the water heater in operation, the temperature of the entire house is made comfortable, and the colony hovers are more easily operated and regulated to the correct brooding temperature, thus protecting the chicks from extreme changes in room temperature that often occur with this method of brooding when something goes wrong with the regulating device or the supply of fuel. Operating colony hovers in a partially heated house also reduces the danger of floor drafts, which are especially liable to exist when the outside temperature is quite low.

In ordinary operation Mr. Parks uses the colony

hover pens for his market or utility chicks, while his best stock—the blue-blooded chicks that are to have the most favorable conditions possible, are brooded in the hot water heated compartments. In writing regarding these two systems and their respective merits, Mr. Parks says:

"I like the pipe system better. I have about as good success with one as with the other and the pipe system is more expensive than the other on account of the greater labor required for caring for small flocks of chicks, also because of the larger investment in equipment. But to get best results chicks should be brooded in comparatively small flocks; moreover, chicks brooded under a colony hover should all be of the same age, and as we do not get as many as 500 chicks of our best matings that we can brood together, it is necessary to have the smaller compartments of the pipe-heated system to care for them.

"Colony hovers no doubt are the cheapest for brooding chicks in large numbers. It takes some skill, however, to handle colony hover chicks after they are ten days old, when, if not carefully handled, they are liable to get switched into corners where they crowd and sweat instead of gathering in a loose open ring under the hover or dome, as they should. In hot weather, also, there is some trouble keeping the fire low enough without having it go out. You will see from this that I use both methods and find both necessary to best results under my conditions. My brooding losses the past two years have not been much more by one method than the other. Have had as few as ten lost at four weeks out of a lot of 500, though, of course, not all lots do so well."

The door of this house is at end opposite the one shown in Fig. 145, and opens into a sunken passageway back of the pipe-heated hover system. The ground in front of the pens is graded up to the sills so that the chicks can pass readily from house pens to yards without the use of special board inclines.

FIG. 146—REAR ELEVATION OF SINGLE PEN
COLONY HOVER HOUSE

From blue print furnished by Poultry Division of U. S. Department of Agriculture.

FIG. 147—FRONT ELEVATION OF SINGLE PEN
COLONY HOVER HOUSE

From blue print furnished by Poultry Division of U. S. Department of Agriculture.

A SINGLE COMPARTMENT COLONY BROODER HOUSE

This Portable House Can Be Moved With a Two-Horse Team if Light-Weight Lumber is Used in Building It.

Where a single compartment house for colony brooding is required, the plans shown in Figs. 146, 147 and 148 will be found practical and economical. These plans were prepared by the Poultry Division of the U. S. Department of Agriculture and houses constructed from them are in use on the Government Experiment Farm at Beltsville, near Washington, D. C.

The plans provide for a 10x10-foot house, on runners for convenient moving, and its general outlines are easily understood from the drawings. All dimensions are indicated. The floor is of tongue-and-groove flooring, laid on 2x6-inch joists set 2 feet apart. Rafters are 2 feet apart, and corners and runners are thoroughly braced. Following is the bill of materials required:

- 125 sq. ft. T & G flooring $\frac{3}{4}$ x2 $\frac{1}{2}$ in. x 10 ft.
- 325 sq. ft. T & G flooring $\frac{3}{4}$ x2 $\frac{1}{2}$ in. x 12 ft.
- 6 pcs. 2x6 inch x 10 ft., for joists.
- 2 pcs. 4x6 in. x 12 ft. for runners.
- 6 pcs. 2x4 in. x 14 ft. for rafters.
- 16 pcs. 2x4 in. x 12 ft. for braces and studs.
- 150 sq. ft. sheathing $\frac{3}{4}$ x12 in. x 12 ft., surfaced 1 side.
- 1 $\frac{1}{2}$ rolls roofing paper.
- 4 sashes, 2 ft. square.
- 2 sashes 18x24 inches.
- Nails, screws, hinges, and paint.

FIG. 149—FLOOR PLAN OF SINGLE PEN HOUSE FOR COLONY HOVER

From blue print furnished by Poultry Division of U. S. Department of Agriculture.

TWO COMPARTMENT COLONY BROODING HOUSE

Requires Less Fuel, is More Comfortable, and More Adaptable to Changing Weather Conditions Than Single Compartment Houses.

Brooding with colony hovers heated by means of oil or coal-burning stoves is a comparatively new method, but one that has become extremely popular wherever chicks are raised in large numbers, and that has practically revolutionized general brooding practice.

As a rule, these hovers are placed in any buildings that happen to be available, and usually with good results. Large brooder flocks necessarily require much

greater floor space than is provided for flocks of 50 to 100, and larger houses or rooms, combined with the method of heating employed, frequently develop floor drafts to some extent. These must be reckoned with, especially in cold-weather brooding. One of the ways of preventing this trouble is to build the house so that it can be divided into two parts of about equal dimensions, placing the hover in one section which is built quite warm but well lighted, the other section being used as an exercising compartment and generally built with a curtain front.

The house illustrated in Figs. 150 and 152 has been carefully designed to meet the special requirements of

FIG. 148—TWO-SECTION MUSLIN COVERED FRAME

This two-section shutter is so made that the upper part can be opened to provide needed ventilation when it is not desirable to have entire shutter open. A cross section of shutter is shown at left. The middle button at top holds upper section firmly in place when closed. The buttons on either side are attached to the frame of section and act as stops.

FIG. 150—CROSS SECTION OF TWO COMPARTMENT HOUSE FOR COLONY HOVER

colony brooding and will be found suitable for the use of the great majority of those who are raising chicks by this time and labor-saving method.

Fig. 152 shows floor plan of house, which is 10x24 feet, with a 10-foot hover section partitioned off at one end. When the chicks are first placed under the hover they are to be confined to this room. It is large enough for several hundred during the first week or two, but not so large as to invite floor drafts, and it can be comfortably heated with much less fuel than would be required to maintain the correct temperature if the entire house were in one room.

When the chicks are ten days to two weeks old, or when only a few days old in mild weather, they should be given access to the exercising compartment, which is provided with a muslin shutter for ventilation. In order to be able to graduate the ventilation, a double shutter is provided so that the upper part may be opened without disturbing the lower section, thus affording fresh air without exposing the chicks to direct drafts from the opening, as would be the case if the entire shutter were to be opened in severe or stormy weather. In milder weather, or when the chicks are older and have been somewhat hardened, the entire shutter may be hooked up, thus giving the chicks practically outdoor conditions without exposure. This shutter is shown in detail in Fig. 148.

Fig. 150 is a cross section of the hover end and Fig. 151 shows the front of the completed house.

BILL OF MATERIALS FOR COLONY HOVER HOUSE

Use	Size	Length	No. of	Remarks
Inches	Feet	Pieces		
Sills, sides	2x8	12	4	
Sills, ends	2x8	10	2	
Sills, half width	2x4	12	4	Spike to inside
Joints	2x6	10	11	face of side sill.
Plates	2x4	12	4	
Studs, front	2x4	8	10	
Studs, rear	2x4	10	6	1 piece cuts 2.
Studs, ends	2x4	16	4	Cut to fit.
Rafters	2x6	10	2	
Window sills	2x5	12	13	
Roof boards	1x10	325	ft. bd. meas.	Surfaced
T & G siding	7/8x6	450	ft. bd. meas.	
Flooring	7/8x4	300	ft. bd. meas.	
Ceiling	5-16x4	350	ft. bd. meas.	
Door & window frames	7/8x6	150	lin. ft.	Surfaced 4 sides
Trim boards	7/8x4	60	lin. ft.	Surfaced 4 sides
Frame for shutter	7/8x3 1/2	25	lin. ft.	Surfaced 4 sides

FIG. 151—FRONT ELEVATION OF TWO-COMPARTMENT HOUSE FOR COLONY HOVER

Frame for top shutter... 7/8x2 20 lin. ft. Surfaced 4 sides
Strip under shutter... 7/8x2 1/2 6 lin. ft. Surfaced 4 sides
Strip under window... 7/8x2 3/4 10 lin. ft. Surfaced 4 sides

3 1/2 squares prepared roofing.
3 squares sheathing paper for floor.
60 sq. ft. wire netting for curtain front.
2 12-light windows, 10x12.
3 pr. 8-inch T-strap hinges.
3 hasps.
4 pr. 2-inch butt hinges for windows.
1 pr. 2 1/2-inch butt hinges for shutters.
1 pr. 3-inch butt hinges for shutters.
4 2-inch screw hooks and eyes.
Nails, tacks and paint.

Capacity of Colony Hover Brooding Houses

Overcrowding is general among chick raisers, but is particularly common in colony-hover brooding where the effects of this mistaken practice are most serious. The wise chick raiser will conservatively estimate the capacity of his house as well as the brooder, and will keep well inside its limits. The house shown in Figs. 146, 147 and 149, is large enough for 300 to 500 chicks for the first two or three weeks, with proper care, but after that time the number positively must be reduced, unless the chicks can be outdoors practically all day long. In that case the flock may remain undivided until the chicks no longer need artificial heat.

At that time the cockerels should be removed, but the pullets may be left to grow to maturity together, provided the house can be thoroughly ventilated. The capacity of the house shown in Figs. 150, 151 and 152 is practically the same as for the smaller house during the brooding period. After the chicks no longer need artificial heat the entire house can be used for perches, thus dividing the chicks into two flocks.

For use early in the season, when the chicks must be confined indoors, estimated capacity should always be discounted considerably, as any brooder house will comfortably accommodate many more chicks when they are running out most of the time. In cold weather brooding, the maximum size of the flock for either house herein described should not exceed 300, and this number must be greatly reduced after the chicks are a few weeks old.

In addition to the brooder houses illustrated and described in this chapter, most of which are designed to be permanent, the reader should consult the plans in Chapter VII.

FIG. 152—FLOOR PLAN FOR TWO-COMPARTMENT COLONY HOVER HOUSE

CHAPTER VIII

Practical Incubator Houses

Where Several Incubators Are Operated Better Results Will Be Secured and Time Saved by Providing a Special Building for Them—Plans Are Here Given for a Moderate-Cost Basement Incubator House With Especial Provision for Adequate Ventilation—Plans for Low Cost Above-Ground Incubator Building, Also a Combination Incubator Cellar and Brooder House.

THE location of the incubator has much to do with its successful operation. Some persons are able to get good results with incubators installed in living rooms and in other locations that are far from ideal, but at best they do it in spite of the location and not on account of it.

Wherever it is at all possible to do so, the incubator should be operated in a cellar, basement, or specially constructed incubator house, such as is illustrated in the following pages. This is desirable, not only to secure a more uniform temperature than is possible in any above-ground building or room, unless very expensively constructed, but because such a room provides more natural and uniform humidity, and is cooler in summer. All practical incubator operators know that it is particularly hard to get good hatches in warm rooms, due chiefly to the difficulty of securing proper ventilation under such conditions.

For one or two machines, the house cellar may be satisfactory, but when three or more are to be operated it often is difficult to secure proper ventilation without interfering with the other uses to which such a cellar must be put. Where chicks are to be hatched in large numbers, therefore, it is desirable to have a special incubator cellar.

The house shown in Figs. 153, 154, 155 and 156 will accommodate ten large-sized lamp-heated machines, but can be reduced or enlarged to suit individual requirements. The floor plan with work-room (see Fig. 157) will accommodate eight machines and is especially recommended as being convenient and practical, and well worth the additional cost.

The outside dimensions of this house are 13 feet 10 inches in width by 26 feet 4 inches in length. This makes the inside dimensions of the chamber 12 feet 6 inches by 25 feet, in the clear. The ceiling is 9 feet 4 inches high. If a smaller house is desired the dimensions may be

changed to suit. For example, a house without vestibule, to hold six large-sized incubators, should be 12 feet 6 inches wide by 15 feet long, in the clear.

In building, remember that the forms for a five-foot concrete wall require heavy bracing. An eight-inch wall is provided in the plan (see cross section, Fig. 153), but a six-inch wall is sufficiently heavy. Whatever the width of the wall, it is desirable to have the bottom extended for footing, as shown in Fig. 155. If soft spots are found in

FIG. 154—SIDE ELEVATION OF INCUBATOR HOUSE

the ground at this depth, which is not probable, the excavation at these points must be carried down to solid ground to prevent cracking and settling of the walls. The side walls at the steps may be four to six inches thick, and the steps should be solid.

The frame of this house is to be of 2x6-inch timbers, with the sills anchored to the foundation wall. The walls above the ground are to be double-boarded with heavy sheathing paper nailed to each side of the studs and the boards laid over this. The ceiling of the room should also have an insulating covering of sheathing paper tacked to the lower face of the joists before the boards are nailed on.

Note that burlap frames are to be provided outside of all windows, screening the windows from the sun and preventing direct air currents when the windows are open. In warm weather or when the wind is not blowing, the burlap screens may be opened outward admitting more air, but still screening the windows from direct sunlight which, if unobstructed, is liable to raise the room temperature several degrees in a short time, and interfere with the regulation of the machines. A shingle roof is recommended for this building as shingles give a more even temperature than prepared roofing. Both gables should have louvered ventilators, as shown.

Fig. 153 shows a cross section of the house without incubators. As regularly planned it is to be built three feet in the ground, and banked up two feet, which calls for a five foot concrete wall, the balance of the side walls being of frame construction. The ceiling is carried up into the gable to give ample height in the incubator room, a more important feature than many realize. The cross section shows the installation of the special ventilator flues, which insure poor air in the room under all conditions. These flues may be of galvanized iron, sewer tile or any other available material that is suitable for the purpose. In

FIG. 153—CROSS SECTION OF INCUBATOR HOUSE

building a new incubator house a good way is to provide for these flues in the concrete wall, which makes them indestructible.

Fig. 106 shows the floor plan as designed for ten machines and Fig. 157 a floor plan with workroom in front. With the latter all lamp filling and trimming can be done outside of the hatching chamber, where convenient facilities may be provided for doing the work. This workroom is used for testing eggs, also for storing hatching eggs where they can be held under the best possible conditions while awaiting their turn to be placed in the machine. The oil supply is to be piped from an outside storage tank or barrel, which may be buried, or supported above the ground on a suitable stand. Where a drain pipe can be installed, the floor should slope to a trap conveniently located, so that it can be flushed or scrubbed at will.

Figs. 154 and 155 show front and side elevations. If the workroom suggested in Fig. 157 is not wanted it is

FIG. 155—FRONT ELEVATION OF INCUBATOR HOUSE

advisable to enclose the steps so as to provide a vestibule, which will assist materially in maintaining a uniform temperature.

The following bill of materials is for a house to be built without workroom. If this is to be provided, sufficient extra material must be added.

FIG. 156—FLOOR PLAN OF INCUBATOR HOUSE FOR TEN MACHINES

FIG. 157—FLOOR PLAN OF INCUBATOR HOUSE WITH WORKROOM

BILL OF MATERIALS FOR INCUBATOR HOUSE

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, side	2x6	14	4	
Sills, end	2x6	14	2	
Plates, side	2x6	14	4	
Plates, end	2x6	14	2	
Studs, front & back	2x6	10	7	One piece cuts 2.
Studs, ends	2x6	8	12	Cut to fit.
Rafters	2x6	10	28	
Ties	1x6	10	13	
Ridge pole	1x7	14	2	
Roof boards	1x10		500 ft.	board measure.
T & G siding	7/8x6		325 ft.	board measure.
Ceiling	7/8x4		700 ft	board measure.
Frame for doors and windows	7/8x6		100 lin. ft.	Surfaced 4 sides
Frame for burlap shutter	7/8x2		70 lin. ft.	Surfaced 4 sides
Trim lumber	7/8x4		150 lin. ft.	Surfaced 4 sides
Barge boards	7/8x8		100 lin. ft.	Surfaced 4 sides
5M. shingles.				
1 door, 2 feet 9 inches x 7 feet.				
6 sashes, 6-light 12x12-inch glass.				
6 metal sash adjusters.				
36 sq. ft. burlap.				
6 bolts 1/2x12-inch with 2-inch washers.				
1 pr. 5-inch butt hinges.				
12 pr. 2-inch butt hinges for windows and screens.				
1 metal ventilator slide 5 inches x 2 feet 3 inches.				
1 door lock.				
4 8-inch ventilator flues with dampers, cords and pulleys complete.				

Nails, tacks and paint.

MATERIAL FOR FOUNDATION AND FLOOR

70 bags of Portland cement.
162 cu. ft. of sand.
325 cu. ft. of crushed stone or gravel.

A SMALL INCUBATOR HOUSE

Where there are practical objections to building the incubator house partially underground, as suggested in the preceding plan, it may be built entirely above ground and, if properly designed, will give excellent service. Such a house has been in successful use at the Western Washington Experiment Station for several years. This house can be built at comparatively slight cost where cheap lumber is available, and is large enough to meet the requirements of farmers and small producers generally. It can be located wherever convenient and requires no excavation. The following description is condensed from Bulletin No. 4 of the Western Washington Station:

"This incubator house, a floor plan of which is illustrated in Fig. 158, is 16 feet wide, 20 feet long, and 9 feet to the eaves, finished with No. 1 rustic, with one-third slope, and has

a shingled roof. The door is in the north end. There are two windows in each side. The south end of the building is built solid, with the exception of the small ventilator in the end near the peak, as seen in the north end above the door and just below the peak. The house was painted red and trimmed in white, giving it a neat appearance.

"To construct an incubator house like the one illustrated in Fig. 158, the following bill of lumber is required:

- 3 pieces 4x4-inch, 20 feet long, for sills.
- 2 pieces 2x4-inch, 20 feet long for plates.
- 11 pieces 2x4-inch, 16 feet long for floor joists.
- 30 pieces 2x4-inch, 9 feet long for studding.
- 11 pieces 2x4-inch, 16 feet long for ceiling joists.
- 22 pieces 2x4-inch, 12 feet long for rafters.
- 650 board feet of matched siding.
- 600 board feet of 1x6-inch sheathing (also used for corner boards and other finish lumber.)
- 4 M cedar shingles.
- 320 board feet of matched flooring.
- 320 board feet of matched ceiling.
- 1 door 2 ft. 8 in. x 6 ft. 8 in.
- 4 window sashes 12x16-inch, 4-light.
- To construct the inner hatching room:
- 22 pieces 2x3-inch, 9 feet long.
- 1200 board feet of matched ceiling.
- 1 door 2 ft. 8 in. x 6 ft. 8 in.

FIG. 158—FLOOR PLAN OF ABOVE-GROUND INCUBATOR HOUSE
Reproduced from Bul. 4, West. Washington Exp. Station.

"The building is constructed on the ground, with a wooden floor (concrete is recommended), and stands on cedar blocks resting on flat rocks projecting above the surface of the ground. The three pieces, 4x4-in.x20-ft., provided in the bill of materials, are used as sills, one on either side and one in the middle. Eleven pieces, 2x4-in. by 16-ft., are nailed to the sills on their edges, two feet apart, and covered with 1x6-in. tongue-and-groove flooring. For studding for the outer walls use 2x4-in.x9-ft., set two feet apart center to center. For plates use 2x4-in. by 20-ft. For ceiling joist use 11 pieces 2x4-in.x16-ft., and for rafters, 22 pieces 2x4-in.x12-ft. Ceil with 1x4-in. tongue-and-groove ceiling. Enclose the building with 1x10-inch shiplap. Cover the rafters with 1x6-in. sheathing laid two inches apart, and shingle. Put in on either side two 3x3-ft. windows, placed five feet above the floor. Build the frames for the windows to admit opening them by sliding. These windows cannot be hung on hinges, since the inner room would interfere in opening them. Now, draw a line around the entire room two feet from the wall. On this line at intervals of four feet place 2x3-in.x9-ft. studding. Ceil both sides of the studding with 1x4-in. ceiling. Put in two ventilator windows, 2x2-ft., 5-in., in each side directly opposite the outer windows and close them with

doors made of matched ceiling. Hang these ventilators with 4-inch strap hinges at the lower edge. To open them, tip them back from the top by means of a cord.

"The door is in the north end and leads into an air space (A) two feet in width, extending around the inner room (D), which is entered through the door (F), which is directly opposite the outer door. The inner room (D) contains six 250-egg incubators (EEE). CC are the windows in the outer wall and are directly opposite and at the same height as the ventilator windows (BBB) in the inner double wall.

"We regard this incubator house a success, securing as it does an even temperature and purest air, both of which are indispensable in the hatching of chicks or turkeys by artificial methods."

It will be noticed that this house is described as being 16 by 20 feet, though in the floor plan the width is indicated as 18 feet, which no doubt is an oversight, as the proportions correspond to the printed descriptions. In the bill of materials the amount of flooring, ceiling, etc., as specified, represents only the surface to be covered, and about one-fourth should be added to the estimates to cover matching and other shrinkage.

The original house built as here described was found to be too warm when all the incubators were running and it is necessary to keep the windows open most of the time. It also was necessary to install a King ventilating system (see page 23) to carry off the lamp fumes and keep the air fresh and pure. With this change the house gives good satisfaction and certainly is more convenient than a cellar.

In considering this plan it should be remembered that the climate of Western Washington is comparatively mild and less provision need be made for warmth than will be found necessary in many sections of the country. The plan of having the entrance door on the north side is desirable in warm climates, but where severe winters are the rule it will be better to have it on the south side. Under such conditions also, building the house with a single board floor will not be satisfactory. If a board floor is used at all, it should be doubled, with heavy insulating material between top floor and sub-floor, and the space between floor and ground should be tightly enclosed by banking up around the building with earth. A concrete floor will be much better for use in cold climates, and probably will be no more expensive.

MAMMOTH INCUBATOR HOUSES

Houses for "Mammoths" Should Be Planned Expressly for the Type of Machine That is to Be Installed in Them.

Sectional, hot water heated incubators, commonly called "mammoth", have come into extensive use in all parts of the country in recent years. These machines make it possible to reduce the labor cost of operating incubators, which is a serious item where tens and even hundreds of thousands of eggs are incubated at one time. Small-sized mammoths, that is, machines consisting of only a few sections, may be successfully installed in any large cellar, and where the method of construction or heating permits, the sections may be carried around corners or arranged in two or more rows, facing each other, or back to back, thus making it possible to install such machines when the cellar is not long enough to take all the sections in one straight line.

building a new incubator house a good way is to provide for these flues in the concrete wall, which makes them indestructible.

Fig. 106 shows the floor plan as designed for ten machines and Fig. 157 a floor plan with workroom in front. With the latter all lamp filling and trimming can be done outside of the hatching chamber, where convenient facilities may be provided for doing the work. This workroom is used for testing eggs, also for storing hatching eggs where they can be held under the best possible conditions while awaiting their turn to be placed in the machine. The oil supply is to be piped from an outside storage tank or barrel, which may be buried, or supported above the ground on a suitable stand. Where a drain pipe can be installed, the floor should slope to a trap conveniently located, so that it can be flushed or scrubbed at will.

Figs. 154 and 155 show front and side elevations. If the workroom suggested in Fig. 157 is not wanted it is

FIG. 155—FRONT ELEVATION OF INCUBATOR HOUSE

advisable to enclose the steps so as to provide a vestibule, which will assist materially in maintaining a uniform temperature.

The following bill of materials is for a house to be built without workroom. If this is to be provided, sufficient extra material must be added.

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Sills, side	2x6	14	4	
Sills, end	2x6	14	2	
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Plates, end	2x6	14	2	
Studs, front & back	2x8	10	7	One piece cuts 2.
Studs, ends	2x8	8	12	Cut to fit.
Rafters	2x6	10	28	
Ties	1x8	10	13	
Ridge pole	1x7	14	2	
Roof boards	1x10		500 ft. board measure.	
T & G siding	7/8x6		325 ft. board measure.	
Ceiling	7/8x4		700 ft. board measure.	
Frame for doors and windows	7/8x6		100 lin. ft. Surfaced 4 sides	
Frame for burlap shutter	7/8x2		70 lin. ft. Surfaced 4 sides	
Trim lumber	7/8x4		150 lin. ft. Surfaced 4 sides	
Barge boards	7/8x8		100 lin. ft. Surfaced 4 sides	
5M. shingles.				
1 door, 2 feet 9 inches x 7 feet.				
6 sashes, 6-light 12x12-inch glass.				
6 metal sash adjusters.				
36 sq. ft. burlap.				
6 bolts 1/2x12-inch with 2-inch washers.				
1 pr. 5-inch butt hinges.				
12 pr. 2-inch butt hinges for windows and screens.				
1 metal ventilator slide 5 inches x 2 feet 3 inches.				
1 door lock.				
4 8-inch ventilator flues with dampers, cords and pulleys complete.				
Nails, tacks and paint.				
MATERIAL FOR FOUNDATION AND FLOOR				
70 bags of Portland cement.				
162 cu. ft. of sand.				
325 cu. ft. of crushed stone or gravel.				

A SMALL INCUBATOR HOUSE

Where there are practical objections to building the incubator house partially underground, as suggested in the preceding plan, it may be built entirely above ground and, if properly designed, will give excellent service. Such a house has been in successful use at the Western Washington Experiment Station for several years. This house can be built at comparatively slight cost where cheap lumber is available, and is large enough to meet the requirements of farmers and small producers generally. It can be located wherever convenient and requires no excavation. The following description is condensed from Bulletin No. 4 of the Western Washington Station:

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a shingled roof. The door is in the north end. There are two windows in each side. The south end of the building is built solid, with the exception of the small ventilator in the end near the peak, as seen in the north end above the door and just below the peak. The house was painted red and trimmed in white, giving it a neat appearance.

"To construct an incubator house like the one illustrated in Fig. 158, the following bill of lumber is required:

- 3 pieces 4x4-inch, 20 feet long, for sills.
 - 2 pieces 2x4-inch, 20 feet long for plates.
 - 11 pieces 2x4-inch, 16 feet long for floor joists.
 - 30 pieces 2x4-inch, 9 feet long for studding.
 - 11 pieces 2x4-inch, 16 feet long for ceiling joists.
 - 22 pieces 2x4-inch, 12 feet long for rafters.
 - 750 board feet of matched siding.
 - 600 board feet of 1x6-inch sheathing (also used for corner boards and other finish lumber.)
 - 4 M cedar shingles.
 - 320 board feet of matched flooring.
 - 320 board feet of matched ceiling.
 - 1 door 2 ft. 8 in. x 6 ft. 8 in.
 - 4 window sashes 12x16-inch, 4-light.
- To construct the inner hatching room:
- 22 pieces 2x3-inch, 9 feet long.
 - 1200 board feet of matched ceiling.
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doors made of matched ceiling. Hang these ventilators with 4-inch strap hinges at the lower edge. To open them, tip them back from the top by means of a cord.

"The door is in the north end and leads into an air space (A) two feet in width, extending around the inner room (D), which is entered through the door (F), which is directly opposite the outer door. The inner room (D) contains six 250-egg incubators (EEE). CC are the windows in the outer wall and are directly opposite and at the same height as the ventilator windows (BBB) in the inner double wall.

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In considering this plan it should be remembered that the climate of Western Washington is comparatively mild and less provision need be made for warmth than will be found necessary in many sections of the country. The plan of having the entrance door on the north side is desirable in warm climates, but where severe winters are the rule it will be better to have it on the south side. Under such conditions also, building the house with a single board floor will not be satisfactory. If a board floor is used at all, it should be doubled, with heavy insulating material between top floor and sub-floor, and the space between floor and ground should be tightly enclosed by banking up around the building with earth. A concrete floor will be much better for use in cold climates, and probably will be no more expensive.

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FIG. 159—FLOOR PLAN OF BROODER ROOM IN COMBINATION INCUBATOR AND BROODER HOUSE

As the manufacturers of the various mammoths on the market usually supply incubator house plans free of charge to their customers, it is not necessary to show detailed drawings here. However, the requirements of mammoth incubators generally do not vary in any essential respect from lamp-heated machines. The house illustrated in Figs. 153 to 156, with its dimensions modified to adapt it to the kind and size of incubators to be installed, will prove just as satisfactory for mammoths as for small machines. There is no better means of ventilating any incubator cellar than by providing a suitable number of ventilating flues, installed as shown in Fig. 153. By means of these, fresh air is discharged into the room at the floor level and the foul air is discharged through adjustable window openings near the ceiling.

As most of the work of filling sections, testing eggs, etc., usually is done right in front of the machine, it is especially convenient to have good, wide passageways so there will be no interference with the work. A large work table on small rubber-tired wheels will prove a great time and labor saver. It also is desirable to have a room at the front of the building where eggs for hatching can be stored; also various articles of equipment that will be needed in the regular daily care of the machine. This should be partitioned off from the hatching room proper, so that the temperature can be regulated as desired.

COMBINATION INCUBATOR AND BROODER HOUSE

A Good Way to Build Where Chicks Are Raised in Large Numbers.

The combination of incubator cellar and brooder house is one that is popular with many, as it brings all the hatching and brooding work under one roof. The house shown in Fig. 160 is of this type. It is in regular use on the Fishing Creek Poultry Farm (Penna.), of which R. H. Loveland is proprietor. This house is 25x76 feet, the basement is substantially constructed, with concrete walls, and extends sufficiently above the ground level so that it is well lighted and ventilated. The cellar is entered through an enclosed vestibule and contains three 10,000 egg machines (one single and two double-decked). The upper part of the house is used as a nursery for chicks, where they have comfortable, convenient quarters and where they remain until they are sold or have passed the danger point, when they are placed out on range.

The brooder room is equipped with a water-boiler, the heating system consisting of six 1 1/4-inch overhead hover pipes running the entire length of the house. These are enclosed in a brooding-box 18 inches high and 3 1/2 feet wide, with a curtain along the front, or the side next to the runs. The flow pipes are next to the passageway and the return pipes next to the hover curtain, which gives a range of about 10 degrees under the hover, enabling the chicks to find just the temperature that suits them. The heat is maintained at about 100 degrees in the warmest part under the hover, for newly hatched chicks, but close to the curtain it is not more than 85 to 90. The floor plan of this brooding room is shown in Fig. 159, from which it will be seen that the house pens are 6x17 1/2 feet, affording room for 300 chicks in each, though 400 may be accommodated when necessary. The chicks are kept in this brooder room about three weeks, after which they are moved to colony houses, so that they can get out on the ground. As this building is located it is not possible to have outdoor runs attached to it.

In many respects this is an ideal way in which to handle chicks in large numbers, for the first three or four weeks of their lives.

FIG. 160—COMBINATION INCUBATOR AND BROODER HOUSE
Photo from R. H. Loveland.

Administration and Other Special Buildings

Large Poultry Plants Need Various Special Purpose Buildings for Handling the Work Efficiently—This Chapter Illustrates and Describes a Complete Administration Building With Fattening Shed; Also, Cockerel and Conditioning House, Fattening Crates and Batteries, Manure Shed, Etc.—Instructions for Equipping the Feed House With Labor-Saving Conveniences.

ON poultry farms of small size it generally will be found more economical, and more convenient as well, to provide suitable storage room for feed, equipment, etc., in the barn, as suggested on page 9. On large plants, however, it is desirable to have a special house for this purpose, usually building it in connection with laying pens, or as a part of a general administration building, such as is illustrated and described elsewhere in this chapter. Wherever the feed room is built, it should be suitably provided with labor-saving appliances, convenient feed bins, etc.

Combination Laying and Feed House

The combination laying and feed house shown in Fig. 161 has been in successful use at the West Virginia Experiment Station for several years, and has a number of features that adapt it to general use. The feed house is placed in the center of a six-pen laying house. It is somewhat wider than the latter, and is one and a half stories in height, with a high gable which provides a liberal amount of storage room on the second floor. Grain, litter, and similar materials are hoisted to the second floor by means of rope and pulley.

The first floor of the feed house generally can be used to best advantage for the storing of heavy grains, such as shelled corn and wheat, and bone cutters, feed mills, cooking appliances, feed mixers, etc., will be installed here, if any are used. Lighter materials, such as ground feeds, baled litter, etc., may be stored above. A convenient plan is to have bins for ground grains on the second floor, these bins being provided with chutes which conduct the contents to the lower floor where they may be drawn off as wanted. Where a feed house is built, it is always desirable to provide a cellar underneath for storing roots, cabbage, or other green foods for winter use, or for sprouting oats. Such a cellar will be found almost as great a convenience as the house itself. An outside door should be provided for convenience in filling the cellar, and an inside stairway for ordinary use.

Equipment for the Feed House

Various articles of equipment may be used in the feed house and, as a rule, it pays to provide whatever will save time or labor. As the requirements of poultry keepers

vary widely in respect to these, and as such equipment usually is purchased piece by piece as the need for it becomes apparent, it is not practicable to furnish an itemized list of needed appliances, further than to mention the few that should be in every feed house, large or small.

For mixing quantities of feed on the floor of the house, nothing is better than a medium-sized scoop shovel. For small quantities of mash, wet or dry, a mixing box should be provided. This should be made of hard, closely-grained wood that will not readily absorb moisture. The boards for the floor of the box should be selected with care, choosing those that are edge-grained rather than flat-grained, as the latter are apt to become splintered and rough after they have been in use for a short time. This mixing box should be about two feet wide and should have straight sides twelve inches high, with the ends sets sloping. It is not easy to mix feed in boxes with square ends. For mixing wet mashes a large garden hoe and an ordinary dirt shovel or a spade will be found serviceable. One or more galvanized bushel baskets and a few 12 to 16-inch galvanized pails are needed on every poultry plant.

Where corn is bought on the ear, it usually is desirable to have a corn sheller, and where fresh meat or butchers' scraps can be secured to good advantage, a bone cutter becomes a necessity. There are few cases in which the poultryman can crack and grind his feeds as cheaply as he can buy them at the feed mill or store, but a small mill for preparing special feeds often proves a convenience and a time-saver. In all cases where home mixtures are prepared, or where feed is ground at local mills, some means of sifting should be provided. The use of unsifted cracked grain, in particular, is a wasteful practice.

There are a variety of uses to which a good feed cooker can be put, such as cooking vegetables, steaming clover, etc.; also for providing hot water to meet the numerous requirements of the average poultry plant in wintertime. While somewhat more expensive than the ordinary sheet-metal feed cooker, a small boiler that will furnish steam for cooking, heating water, etc., will be found much more convenient in the long run.

Plenty of well-constructed bins should be provided in

FIG. 161—COMBINATION FEED AND LAYING HOUSE AT WEST VIRGINIA EXPERIMENT STATION

FIG. 162—CONVENIENT BINS IN FEED HOUSE

Above illustration shows a convenient arrangement of feed bins, which in this case are built with a 6-inch space between bins and floor and walls, to allow circulation of air. Illustration shows two bins with the fronts down for filling and two with receiving boxes in place, ready for shovelling out feed.

the feed house, and these should be large enough to meet all probable requirements without carrying the sides too high. It should not be necessary to have to lift grain bags more than shoulder high in order to empty them.

The plan of having bins for ground grains on the second floor, with chutes to conduct contents to the feed-mixing room on the ground floor, has already been suggested. Wherever the bins are located, they should be

made thoroughly tight on all sides, using well-seasoned T. & G. boards. Lumber should be used that is not liable to split, as it is necessary to use large-sized nails and a good many of them to make these partitions strong enough to withstand the heavy pressure to which they will be subjected. Bin fronts should consist of loose boards sliding in a groove so that they can readily be removed and replaced for ease in filling and emptying. The bottom board in the front should have a sliding door large enough to admit a scoop shovel. It is easier to shovel from the bottom of the bin than to lift the feed out over a high partition. See that the boards forming the floor of the bin run from front to back, instead of from side to side, for convenience in shoveling.

Another way of arranging feed bins is shown in Fig. 162. Here the bins are built independently of the house, with a 6-inch air space between floors and walls to protect contents from dampness. The bins can be filled from the top, which is hinged, and the fronts also are made with an upper hinged section to be let down for greater ease in filling. A receiving box is provided so that when door at bottom of bin is opened the contents will not run out on the floor. This box is so made that it can be pushed back under the bin floor, out of the way, when not needed.

It is always desirable to make the feed room of ample dimensions, as it frequently is necessary to spread new grain or damp feed of any kind loosely on the floor, rather than to put it in bins where it will quickly heat and mold. This is particularly true in the case of corn meal and new shelled or cracked corn, which can seldom be placed in large bins with safety. For storing ear corn in the fall it is desirable to have a ventilated crib of slats or wire screen so that air can circulate through it. If it is to be stored in a feed house or a limited supply kept for immediate use in the poultry house, the sides of the bin should be made of wire screen or 1-inch mesh poultry netting, rather than of tight boards.

ADMINISTRATION BUILDING FOR LARGE PLANTS

Large Plants Need a House Like This One Where Much of the Daily Work Can Be Performed Under

One Roof.

The house plans illustrated and described in the preceding pages, cover all practical requirements of the average poultry plant, large or small, as regards accommoda-

FIG. 163—FIRST FLOOR PLAN IN ADMINISTRATION BUILDING

tions for brooder chicks, laying flocks, breeding pens, etc. There are very large poultry farms, however, that do not require a large, centrally located house where feeds and miscellaneous supplies can be stored and in or about which can conveniently be grouped facilities that are necessary for efficiently administering the work of the farm. Generally such a building should be planned on a sufficiently large scale to provide ample storage on the ground floor, with a room for killing and dressing table fowls. A basement will afford room for incubators at much less cost than the construction of a separate building for this special purpose. A second floor will provide comfortable quarters for one or more of the men employed on the place, and an extension may be added on one side for a long brooder house to be equipped with lamp-heated hovers, colony hovers or a hot-water pipe brooding system. On the other side an extension for crate feeding table fowls will be found most convenient when these are to be produced in considerable numbers.

Such an administration house is illustrated and described on this and following pages. It is large enough to meet the requirements of quite an extensive farm and needs only to be reduced proportionately all round to adapt it to a much smaller place. Any competent carpenter will be able

FIG. 164—CE

FIG. 164—CELLAR FLOOR PLAN IN ADMINISTRATION BUILDING

readily to make the needed changes and adapt the bill of materials to lesser proportions.

Fig. 164 gives the floor plan of the incubator cellar which is large enough to accommodate 20 to 30 large-sized lamp-heated incubators, or two mammoth if they are preferred. Where extra-large hatching capacity is required, the cellar can be extended under the fattening room, thus doubling its size. The ventilation of this cellar is not indicated in drawing but the plan shown on page 79 should be followed. Build the intake flues into the concrete or stone foundation wall, however, thus making them practically indestructible. Where there is no sewerage system available it will be necessary to provide a cesspool or septic tank outside the building to take the waste from the killing room, men's toilet, etc., and

FIG.165—SIDE ELEVATION OF ADMINISTRATION BUILDING FOR LARGE POULTRY FARM

number of fowls are to be fed, the noise which they make when all the birds are feeding at one time is often considered objectionable as it is liable to cause disturbance among the fowls.

Fattening crates do not have to be located in a house but may be kept in any sort of shed or, in mild weather, may be placed outdoors in the shade in any convenient, quiet spot. It is only necessary to throw a couple of boards or a strip of roofing over the top to keep the rain out, in order to make the birds comfortable.

Where fowls are to be fattened in large numbers the use of portable feeding batteries, which can be bought ready-made, is recommended. A battery consists of 8 to 16 separate compartments, each holding several fowls. They usually are made with woven-wire floors and with droppings pans under each compartment, so arranged that they may be removed easily for cleaning. Each battery rests on castors or small wheels, by means of which it may readily be moved wherever wanted.

The battery shown in Fig. 170 has a double tier of coops containing 16 compartments in all, and is capable of accommodating in the neighborhood of 100 fowls—more than that number if small, and less if full grown. The feeding troughs with this battery are of galvanized iron and the floors are of wire, which offers no chance for the droppings to stick to the feet of the fowls. The droppings trays are of wood.

A COCKEREL HOUSE

A House for Surplus Cockerels and for Wintering Breeding Males. Convenient Conditioning Room, For Fitting Exhibition Fowls.

Where fowls are bred in large numbers, there is always need for a building in which the surplus males may be kept when not wanted in the breeding pens,

where exhibition birds may be fitted and trained, and where fowls of any sort may be cooped individually when it is desirable to do so. Plans for such a house are shown in Figs. 176 and 177. This house is 13x60 feet in the clear and provides room for 120 individual coops, each 1 foot, 8 inches by 3 feet, and 2 feet 2 inches high. Coops of this size afford ample room for sin-

gle individuals, or for two or three small or medium sized birds for a short time, if they get along peaceably together. In addition to the coops there is a conditioning room at one end of the building and room at each end of the cooping room for storage of food, litter, etc.

Fig. 176 shows the floor plan of the building. The provision for 17 2-sash windows may seem excessive but it must be remembered that much more window surface is required to light numerous small pens than would be needed for one large open room.

Pen floors and partitions are to be of tongue-and-groove ceiling boards nailed to $\frac{3}{4}$ x2-in. strips as shown in cross section. The pen fronts are to be of a good grade of wire fencing with the upright wires spaced about two inches apart and the joints welded or fastened with wire locks so that there will be no sharp wire ends to injure combs or cut neck feathers. The pen doors are of the same material and arranged as in Fig. 175, which makes their construction quite simple. Fig. 173 is from a photograph of a house built in accordance with this plan but considerably larger than the one shown in the drawing. In cold climates this house should be built with double walls, the inside wall being of tongue-and-groove ceiling and warmly constructed throughout. In most instances a concrete floor should be provided, but the lower pens should have board floors, laid on 1-inch furring to make an air space

FIG. 174—CROSS SECTION OF FATTENING SHED IN ADMINISTRATION BUILDING

FIG. 173—INTERIOR OF COCKEREL HOUSE

FIG. 175—PEN FRONT IN COCKEREL HOUSE

FIG. 176—FLOOR PLAN OF COCKEREL HOUSE

between concrete and pen floors. The following is the bill of materials required for this cockerel house.

BILL OF MATERIALS FOR COCKEREL HOUSE

Use	Size Inches	Length Feet	No. of Pieces	Remarks
Sills, sides	2x4	10	12	
Sills, ends	2x4	14	2	
Plates	2x4	10	12	
Studs, front	2x4	10	34	
Studs, rear	2x4	12	17	1 piece cuts 2.
Studs, ends & misc.	2x4	10	45	Cut to fit.
Rafters	2x6	16	30	
Window and door sills	2x6	10	6	
Roof boards	1x10	1100 ft. bd. meas.		Surfaced.
T & G siding	7/8x6	1500 ft. bd. meas.		
Ceiling	5/8x4	3500 ft. bd. meas.		
Flooring for pens, doors, etc.	7/8x4	1200 ft. bd. meas.		
Furring for floors of bottom pens	7/8x2	275 lin. ft.		Surfaced.
Ceiling boards for parts	7/8x4	1600 ft. bd. meas.		
Door and window frames	7/8x5	300 lin. ft.		Surfaced 4 sides.
Strips base of windows	7/8x4	75 lin. ft.		Surfaced 4 sides.
Weather strips	7/8x7/8	100 lin. ft.		Surfaced 4 sides.
Trim boards for partition fronts	7/8x2 1/2	600 lin. ft.		Surfaced 4 sides.
12 squares prepared roofing.				
12 squares sheathing paper.				
17 2-sash windows, 12-light, 10x12-inch glass.				
420 sq. ft. heavy wire fencing, for pen fronts.				
12 anchor bolts, 1/2x12-inch, with 2-inch washers.				
3 pr. 8-inch T-strap hinges.				
2 hasps.				
17 pr. 2-inch butt hinges for top sash.				
Plumbing for washing room.				
Nails, double-pointed tacks and paint.				

MATERIALS FOR FOUNDATION AND FLOOR

90 bags Portland cement.
200 cu. ft. of sand.
350 cu. ft. crushed stone or gravel.
200 cu. ft. crushed stone or gravel for filling.

FIG. 177—CROSS SECTION OF COCKEREL HOUSE

A DRYING COOP

Will Pay for Itself in a Season if Many Fowls Are to Be Fitted for Exhibition. Can Be Equipped for Oil Heater.

The specially constructed drying coop shown in Fig. 178 is a most convenient piece of equipment for the con-

FIG. 178—DRYING COOP USED IN FITTING FOWLS FOR SHOW ROOM

ditioning house. The size will be regulated by the number of fowls that are to be handled, but the one here shown is about three feet wide, three feet deep and five to six feet long. As will be seen, it is warmed by means of hot water pipes in the bottom, the heat being supplied by a small gas burner. Perches are provided on which the fowls perch while drying and underneath are trays for the droppings. With the front curtains down the temperature can be quickly raised to any desired point and held there quite uniformly by occasionally consulting the thermometer suspended in the chamber. Making use of a drying closet like this will be found much better than the laborious method of fanning, and better too than placing the birds in an open coop in a warm room and leaving them there to dry out slowly. When gas is not available for use it will not be difficult to adapt a good blue flame oil burner to the purpose.

CONCRETE MANURE SHED

Save the Droppings and Make Them a Source of Added Profit.

By DR. RAYMOND PEARL *

One of the most valuable by-products of any live-stock industry is the manure. Its proper care and use is one of the distinguishing features of a successful stock farm. The high nitrogen content of poultry droppings makes them in certain respects the most valuable of farm manure. At the same time this quality necessitates special treatment to preserve the nitrogen and utilize it economically.

This Station (Maine) recently built at its poultry plant a manure shed large enough to accommodate the droppings from one thousand adult birds over a period of a year; also the droppings collected from the range where three thousand chicks are annually reared. The inside measurements of this shed are 7x12 feet. It is 5 feet high

roof boards and gables. The roof is covered with roofing paper. In one side of the roof are two trap doors also covered with this roofing. Each of these doors is 2 feet 4 inches by 2 feet 10 inches and fits over a frame in the roof, to which it is hinged at the top. The end of a lath is attached by a double screweye to the inside of each door at the right edge, about half way from bottom to top. The edge of this lath is provided with notches which hook over a nail on the inside of the door frame. When hooked this lath holds the door open. A 2x4 strip is nailed across the inside of each door frame a little more than half way from bottom to top. This serves as a rest for the basket when droppings are emptied into the shed.

This shed is placed at the end of the line of poultry houses and the raised walk which extends along the entire front of the houses is continued past the shed and built on an incline, so that at the end of the shed it is only 1 foot 8 inches from the eaves.

HOSPITAL FOR SICK FOWLS

Every person who keeps large numbers of fowls needs a special isolated building where sick or injured birds can receive treatment. This hospital should be conveniently located, and properly equipped for the work. Do not make the mistake of selecting some old building for this use simply because it is worthless for any other purpose. It is impractical to bother with hospital cases at all, unless a convenient building is provided in which to do the work, and in which the fowls can be kept comfortable.

Sick or injured fowls should never be penned together in flocks, but should have small individual coops similar to those shown in the cockerel house described elsewhere in this chapter. An ideal fowl hospital can be provided by building a section of this cockerel house of suitable size. For small numbers the width can be reduced to about eight feet, with coops along the rear wall and across the ends, but always leave an operating room not less than five feet in width along the front, where there should be provided an operating table and a set of shelves stocked with suitable remedies, disinfectants, and such other materials as are needed in caring for the sick or injured fowls. For convenience in cleaning, the bottom bar of the coop front should be two or three inches above the floor so that all litter, droppings, etc., may be easily scraped into a suitable pan or trough on the outside. This opening should be closed by a narrow door to prevent the litter from being scratched out by the fowls.

The hospital building should have a concrete floor and, in cold climates, should be double-walled and provided with some means of heating it. Sick fowls are not able to stand the degree of cold that healthy fowls find entirely comfortable, and if special treatment is to be given, the operator will find it much more satisfactory to be able to warm the house to a comfortable temperature.

FIG. 179.—CONCRETE MANURE SHED
Photo from Maine Exp. Station.

at the eaves and 8 feet 2 inches to the peak of the roof. See Fig. 179. The foundation is a solid block of cement and rock smoothed off at the ground level to form the floor. At the edges of the foundation the cement is continued up into the wall forms which were built so that the walls are 10 inches thick at the base and six at the top. The droppings are thrown into the shed through trap doors in the roof, and taken out from one end, which is of removable plank. The cement wall in the plank end is continued far enough from either corner to provide a place for the slot into which the planks are slipped. This slot is a groove two inches deep and a little more than two inches wide, and is formed by placing an angle iron post within the board forms.

The gables are of boards. The gable at the open or plank end of the shed is removable, to give more head room when shoveling the manure into carts. It is held in place with hooks. The roof is secured to the walls by bolts and rings, as shown in Fig. 179. The plates and rafters are of 2x4 timbers. Inch boards were used for

* Condensed from Maine Station Bulletin No. 216.

CHAPTER X

Interior Fixtures and Equipment

Practically Everything Needed to Equip the Poultry House is Here Illustrated and Described—Partitions and How to Build Them—Location of Perches and Nests—Various Types of Nests for Layers—Trap Nests for the Breeding Pens—Feed Troughs and Hoppers, Water Vessels, Trolleys, Oat Sprouters, Advantages of Winter Illumination—Coops for Broody Hens, Etc.

MOST of the poultry house plans given in this book are simple and plain almost to the point of bareness. This is not due to any failure to appreciate the importance of suitable fixtures and equipment, but because in plans intended for general use it is better to omit everything that is not clearly essential and leave it to each individual to add, from time to time, such labor-saving features as his own experience and his particular needs indicate will be necessary or helpful. About everything that is likely to be required in the way of fixtures and equipment, inside and outside of the poultry house, will be found described and illustrated in the following pages, and it is a simple matter to adapt any of them for use in the house plans already presented.

Simplicity in the poultry house is desirable, but simplicity may be overdone. It is well to recall, now and then, that the house and its facilities are provided as much for the convenience of the attendant as for the use of the fowls, and anything that will make the work of caring for the fowls easier should by all means be installed. Time and labor-saving equipment about the poultry plant is of the first importance, especially where fowls are kept in large numbers, and it is a serious mistake to fail to provide anything that will save time or make the work lighter.

For the most part, the equipment of the poultry house should be simply made, and easily removable for cleaning. This does not apply to such fixtures as partitions between pens or along alleyways, which are properly a part of the house and should be permanently constructed. As a rule, this also applies to the droppings platform and nest supports. These can be made movable, but it is simpler and easier to fasten them in place. If the house becomes infested with lice and mites, it is, of course, desirable to be able to take everything out for thorough treatment, but there is no practical advantage in an arrangement which involves continual inconvenience because it would be desirable to be able to throw everything out of the house in

the event of its sometime being overrun with mites—a condition that need never be encountered with reasonable care. It is better to determine to take the proper preventive measures from the start, and if that is done there will never be any occasion for the unpleasant job of emptying the house out to fight lice and mites.

FIG. 181—PEN FRONT IN HOUSE WITH PASSAGEWAY

PASSAGEWAYS AND PARTITIONS

When Passageways Should Be Used. Planning Them to Save Labor. Partitions That Protect the Fowls.

Where passageways are provided it is possible to incorporate a number of features that will aid greatly in the work of caring for the fowls. A practical plan for a passageway partition is shown in Fig. 181. This partition is nailed permanently to studs, the spacing of which will be determined, of course, by the width of the pens. The baseboard should be at least six to eight inches in width and better if ten inches, as the fowls will scratch the litter out into the passageway and the feed trough if the board is too narrow.

The feed trough is provided especially for use where a wet mash is fed, but it will be found convenient also for feeding kitchen scraps, green food, and various other articles, and for that reason should be provided even though it is the intention to supply the mash dry in hoppers. The square frame next to the trough is to support the water vessel, which may be a bucket or crock. Place the vessel about as high as the fowls can well reach so as to keep the litter from being scratched into it. It is a good plan to provide a platform on the inside for the fowls to stand on, making it about a foot high and with the water vessel correspondingly raised.

The upright pieces may be of two-inch strips surfaced and the edges rounded so that the fowls' neck feathers will not be worn off by rubbing against sharp corners. These slats should be about 22 to 24 inches long, if nailed on, as shown in the illustration. A neater way of fastening them is to cut them the exact length of the space between A and B (about 18 inches) and set them with the face of the strips flush with the front of A and B, toenailing them in place, or nailing to back-strips attached to the

FIG. 180—INTERIOR OF WELL-EQUIPPED LAYING HOUSE

Photo from U. S. Department of Agriculture.

inside faces of A and B and extending beyond them about half an inch, thus providing supports for the top and bottom of the uprights.

Above strip B is an eight-inch board which forms the door into the nests, by means of which the eggs may be gathered without entering the different pens. Strip D should be four inches wide and above it is another door

FIG. 182—DETAIL OF CONSTRUCTION OF DROPPINGS PLATFORM, PERCHES, AND NESTS

opening flush with the top of the droppings platform so that the droppings may be scraped directly into a box or trough provided for the purpose and which can be wheeled readily from one pen to another. This door should be about 12 inches wide and is hinged to the four-inch strip (F) above.

In the illustration the partition from this point to the top is wire netting, but it is a much better plan to make it of heavy muslin, or at least to provide a curtain of this material that can be used in cold weather to protect the fowls from drafts when on the perches. The door into the pen, which is indicated on the right, should be at least 2½ feet wide, and should be constructed with a frame of four-inch lumber with wire netting to cover it. There should be an 8 to 12-inch baseboard, which should be made movable, supporting it by means of cleats, so that it can be taken out and the dirt on the pen floor swept out into the passage.

PARTITIONS

The style of partition shown in Fig. 64 will be found suited to the requirements of most persons. The base of the partition should always be at least two feet high and built tight to prevent the fowls from being distracted by whatever may be going on in the adjoining pens, and also to prevent floor drafts. Next to the rear wall the partition is carried up tight to the rafters and should extend one or two feet beyond the front perch. This forms a sort of open closet for the perches, helping to keep the fowls warm on cold nights and screening them from direct air currents. The rest of the partition may be of two-inch netting carried up to the rafters.

As a rule, the best place for the partition door is close to the front, so that the attendant may pass through from

one pen to another with the least possible disturbance to the fowls. Partition doors should be wide—not less than 2½ feet—wider is better—so that it will be possible to go through without crowding, or to use a wheelbarrow in cleaning out the pens. Use double-acting spring hinges, if possible, as they save time and trouble and the doors are sure to close. If spring doors are not used, attach weights to the doors so that they will stay shut without having to be fastened, or use the simple door fastener shown in Fig. 213 on page 101.

DROPPINGS PLATFORMS AND NESTS

Why Droppings Platforms Are Provided. How to Build Convenient Laying Nests.

Droppings platforms should be located about 2½ to 3 feet above the pen floor, unless heavy fowls are to be kept, in which case they should not be over two feet. With the platform 2½ to 3 feet high there is room for nests under the platform, which is the most desirable place for them, as a rule. Platform boards should always run the short way of the platform, or in the direction in which the droppings are to be scraped out, which makes cleaning much easier. Use tongue-and-groove boards with a smooth surface, such as flooring boards, and remember that the lumber will swell when the droppings begin to accumulate on them, for which reason the boards should not be driven up tight together, but left with room to expand. Platforms should always be built level, not sloping, and should extend fully a foot beyond the front perch.

Platforms are provided in order to keep the droppings from mixing with the litter, also to make the floor space under the perches available for scratching purposes. They should be supported on 2x4 stringers, front and back, so that the platform will always hold its shape and remain level. One-inch lumber when used for this purpose will bend under the weight of the platform and must be supported at frequent intervals. Numerous supports are a nuisance in cleaning the floor, however, and it is better to use 2x4 stringers, in which case the upright supports may be spaced at least eight feet apart.

A Manure Pit for the Laying House

In some instances droppings platforms are omitted and a 10-inch board is placed on edge on the pen floor, about a foot in front of the perches. The droppings are allowed to fall on the floor and accumulate there until it is convenient to remove them. By this plan it is possible

FIG. 183—MANURE PIT TO TAKE THE PLACE OF DROPPINGS PLATFORM

Reproduced from Ex. Bul. 16, Clemson (S. C.) Agr. Col.

to avoid the frequent cleaning that is necessary where platforms are used, and if earth or fine litter is sprinkled over the droppings often enough to keep them dry, they may be allowed to accumulate for a considerable time before there will be any noticeable odor. The following de-

scription of a manure pit designed to take the place of the droppings platform, and to facilitate cleaning out the droppings, is given by Prof. F. C. Hare in Extension Bulletin 16, Clemson (S. C.) Agricultural College:

"The dropboard under the roosts to prevent the manure of the roosting fowls soiling the floor, answers the purpose for which it is designed, but it is unsightly. With small flocks, a frequent scraping of the dropboard will keep it presentable, but, unless large dropboards are cleaned daily, the accumulation of manure from a flock of several hundred hens becomes quite objectionable in even a few days. To remove the manure daily requires labor and time that frequently cannot be provided in busy seasons.

"I have designed a manure pit from which the manure can be hauled away in a wagon. It is unnecessary to remove the manure more often than once a month if the moisture is absorbed, and during this time the manure cannot be seen by anyone walking through the house. To absorb the moisture, the manure is covered every few days with an inch of dry earth or sand. This procedure is identical with that prescribed for making a compost bed for fertilizing the garden, so that the manure is being improved while it is being collected in sufficient quantity to warrant hauling it away.

"The floor and 12 inches of the front and rear walls of the manure pit should be built of concrete. A good formula is: one part of cement, $2\frac{1}{2}$ parts of clean, sharp sand, five parts of coarse gravel. The remaining, or upper two feet of the front wall, is made of lumber. The roosts are fastened together in sections to slide forward out of the way, or the sections are hinged to the front wall of the pit and raised with a cord. The manure is removed through a door in the rear. In long houses a door for this purpose is put in every 20 feet.

"A road should be made at the rear, or north side of the house, for the use of the horse and manure wagon. The manure and earth, collected in this way once a month, or when required, can be taken to the vegetable or flower garden and used at once. It is an excellent fertilizer. If you wish still further to improve it, sprinkle 16 per cent of acid phosphate over the manure just before you cover it with earth. The acid hastens the ripening of the manure." See Fig. 183 for cross-section of house with manure pit as herein described.

Perch Supports

There are various methods of supporting the perches. Under most conditions it is desirable to have the roosts back as close as possible to the rear wall, in which case

FIG. 184—SATISFACTORY WALL NESTS

FIG. 185—FRONT ELEVATION OF WALL NESTS

they may be supported over the platform, either as shown in Fig. 85, where metal lice-proof perch holders are used, or by means of a horizontal bar suitably notched, the bar being supported in front on a short leg or block and in the rear by a four-inch strap hinge, by means of which the perches may readily be raised when the platform is to be cleaned. If the perches are not too long the supporting bar can be attached directly to the sidewalls, but it is not desirable to have perches over 12 feet in length, unless they are supported in the middle. Instead of hinges, the horizontal bars often are suspended from the rafters by a stout wire at each end. This arrangement makes it practically impossible for mites to pass back and forth from walls to perches and nothing but the grossest neglect will permit mites to infest the house.

Perches should be of 2x4 material if over six feet long, and should be surfaced, and the upper edges of the perches should always be rounded. Square-cornered perches will cause corns, which may later develop into bumblefoot. The back perch should be 10 to 12 inches from the rear wall and the rest spaced 12 to 14 inches apart. Round poles with the bark off make good perches, but should be well seasoned before using, as they are much stiffer than green poles, which frequently bend so badly as to become quite uncomfortable for the fowls.

Roosting Closets

In severe climates roosting closets sometimes are a necessity in order to protect from injury the combs and wattles of valuable breeding fowls. Fig. 186 shows a simple way of providing such a closet by installing a shutter in front of the perches, making it wide enough to reach from droppings platform to roof. The shutters

FIG. 186—ROOSTING CLOSET FOR LARGE COMBED FOWLS

should be made in sections, as here shown, when the platforms are more than 8 feet long. Do not use heavy material for covering the shutters, as it is not desirable to restrict air circulation more than is necessary to prevent frosted combs. As a rule, burlap will prove sufficient for the purpose.

Platform Nests

The platform nests shown in Fig. 182 are easily constructed and will be found practical and convenient. The brackets and bottom boards are permanent while the rest may readily be removed for cleaning and disinfecting. The

FIG. 187—CROSS SECTION OF WALL NESTS

bottom board is two inches narrower than the nest partitions, so that when these are in place there will be an inch space on each side of the bottom boards, which makes the nests self-cleaning to some extent. Instead of placing the front platform stringer flat, as in the illustration, many prefer to make the platform two inches higher so that the stringer may be set on edge, making the platform more rigid. Nests should be made of light-weight material, such as white pine, for ease in handling, but do not use too thin boards. Three-quarter-inch or 13-16-inch stuff is as light as it is advisable to use. Nest boards should be surfaced on all sides. It is

easier to keep them clean if smooth and it takes less time and less material to paint them with lice paint or disinfectants. Do not make the nests too long. A set of four or five nests is easier handled than when longer. For a set of platform nests the following material will be required.

BILL OF MATERIALS FOR FIVE PLATFORM NESTS

Door	$\frac{7}{8}$ x 7 inches	6 lin. feet
Front (below door)	$\frac{7}{8}$ x 6 inches	6 lin. feet
Nest bottom	$\frac{7}{8}$ x 12 inches	6 lin. feet
Back strip	$\frac{7}{8}$ x 4 inches	6 lin. feet
Top strip, front and back	$\frac{7}{8}$ x 2 inches	12 lin. feet
Partitions	$\frac{7}{8}$ x 11 inches	7 lin. feet
Running board	$\frac{7}{8}$ x 6 inches	6 lin. feet
Bracket	$\frac{7}{8}$ x 4 inches	10 lin. feet

1 pr. 4-inch T-strap hinges.

1 wooden button.

No allowance made for waste in cutting.

Orange Box Nests

Fig. 188 shows how ordinary orange boxes may be utilized as nests. Such nests are a trifle small for large

FIG. 188—NESTS MADE FROM ORANGE BOXES

hens, but for Leghorns they are quite satisfactory. If attached to the wall or partition by means of a couple of hooks and eyes, as shown in the illustration, they will require no other support and can be taken out for cleaning with the slightest possible trouble.

Wall Nests

A good type of nest is shown in Figs. 185 and 187. The construction is easily understood from these illustrations. It will be noticed that the bottom board in front of each set of nests is hinged at the top so that it may be raised up and the nests conveniently cleaned without moving them. These boards are held in place by means of small screw hooks and eyes. Fig. 184 shows a set of 18 wall nests arranged in three tiers, but for ordinary use eight nests in two tiers are as many as it is advisable to build together. For such a set the following lumber is required:

BILL OF MATERIALS FOR EIGHT WALL NESTS

Top boards	$\frac{7}{8}$ x 10 inches	9 ft. 2 in. lin. ft.
Back Boards	$\frac{7}{8}$ x 10 inches	15 ft. 0 in. lin. ft.
Sides	$\frac{7}{8}$ x 7 inches	12 ft. 0 in. lin. ft.
Bottoms	$\frac{7}{8}$ x 8 inches	8 ft. 6 in. lin. ft.
Bottoms	$\frac{7}{8}$ x 7 inches	8 ft. 6 in. lin. ft.
Running boards	$\frac{7}{8}$ x 6 inches	8 ft. 6 in. lin. ft.
Partitions	$\frac{7}{8}$ x 12 inches	7 ft. 0 in. lin. ft.
Front boards, bottom	$\frac{7}{8}$ x 4 inches	8 ft. 6 in. lin. ft.
Front boards, top	$\frac{7}{8}$ x 2 inches	8 ft. 6 in. lin. ft.
Support for running bds.	$\frac{7}{8}$ x 2 inches	7 ft. 4 in. lin. ft.
Strips	$\frac{7}{8}$ x $\frac{3}{4}$ inches	7 ft. 0 in. lin. ft.

If T & G boards are used for top, back, etc., get 55 ft. board meas.

2 pr. 1-inch butt hinges.

4 2-inch hooks and eyes.

No allowance made for waste in cutting.

Sectional Nests.

The nests shown in Fig. 189 are adapted for use either in the laying house or for sitting hens. They are built with solid bottoms, backs and ends, and may be stacked

FIG. 189—CONVENIENT SECTIONAL NESTS

up one on the other in the fashion of sectional bookcases, which suggests the name. The doors are on hinges and are supported in a horizontal position by means of strong cords or wires, and in this position serve as running boards. They can be closed when necessary, turned to face the wall, or placed in any other position. They can be made in sets of two, three or four, though the latter is not advisable unless light-weight wood is used. For sitting hens they should be made 13 to 15 inches high, and about 14 inches square.

TRAP NESTS

Plans for Trap Nests That Are Easily Made and Reliable in Action.

A simple, convenient trap nest that has given the best of service for many years is shown in Figs. 190, 191 and 192. The hen in entering the nest raises the door slightly, which releases trigger B in Fig. 191, and as soon as she has passed from under the door it drops in place and the hen will have to remain in the nest until released by the attendant. Fig. 190 shows all the different parts that enter

into the making of the nest. Use the following key in studying the illustration:

A. Galvanized iron door 9x9 inches square. Edges turned to stiffen. Upper edge has No. 9 fence wire inserted in fold, this wire extending about $\frac{3}{4}$ -inch at each end beyond sides of door. B. Wood trigger, $\frac{7}{8}$ x $\frac{7}{8}$ inches in width and thickness, and 2 $\frac{1}{2}$ inches in length. Has notch cut in lower end. Upper end has common wire staple driven in part way, with an extra staple looped through this one. Is fastened to cross top rail (see Fig 191) so that galvanized iron door will just clear it nicely when raised. C. Top rail $\frac{7}{8}$ x2x12 inches. Trigger (B) is to be attached to this rail. D and E, front and back of nest—duplicates; 12 $\frac{1}{2}$ inches wide by 10 $\frac{3}{4}$ inches high. Bottom rail $\frac{7}{8}$ x3x12 $\frac{1}{2}$ inches. Top rail $\frac{7}{8}$ x1 $\frac{1}{4}$ x12 $\frac{1}{2}$ inches. Side rail $\frac{7}{8}$ x2x6 $\frac{1}{2}$ inches. Strips are $\frac{7}{8}$ x $\frac{7}{8}$ x10 $\frac{3}{4}$ inches. Back of nest can be made solid, if desired. F and I, sides of nest, each $\frac{3}{8}$ x10 $\frac{1}{2}$ x20 $\frac{1}{2}$ inches. G. Bottom of nest or floor, $\frac{3}{8}$ x12 $\frac{1}{2}$ x20 $\frac{1}{2}$ inches. H. Strip $\frac{7}{8}$ x2 $\frac{3}{4}$ x12 inches, used

FIG. 190—PARTS REQUIRED IN PRACTICAL TRAP-NEST

mid-way between front and back of nest to hold nest material in place. See Figs. 191 and 192 for construction of nest and nest in use.

The Connecticut Trap Nest

By ROY E. JONES and LESLIE CAIRD

The trap nest shown in Fig. 193 was developed in connection with the International Egg Laying Contest at Storrs. The important parts of this nest are the door and trigger. The door is hung at the top on No. 8 or 9 wire by means of strips of hoop iron tacked along the edges of the door. These strips extend above the top of the door and a hole is punched in the upper end through which the wire runs. The door is made narrower at the bottom than at the top to prevent its binding on the sides of the nest. The door when completed and in place is practically proof against trouble as there is nothing to get loose or wear out.

The dimensions of the trigger are shown in the diagram (Fig. 193). The trigger is perhaps more easily made from a $\frac{7}{8}$ x2-inch strip. The $\frac{3}{4}$ -inch dimension and the 2 $\frac{1}{2}$ -inch dimension may be measured off on the two parallel edges, which are two inches apart. Then the $\frac{1}{2}$ -inch dimension may be drawn and the $\frac{1}{2}$ -inch one perpendicular to it. These leave only the 2 $\frac{3}{8}$ -inch line to be drawn, which is easily done. The point for making the screw hole is determined as follows: draw a line parallel to the $\frac{1}{2}$ -inch side and $\frac{1}{2}$ inch from it. Then measure along this line to a point 2 $\frac{3}{4}$ inches from the point of the trigger.

FIG. 191—HEN ENTERING TRAP NEST

This point will be the center of the screw hole. The screw hole should be large enough to allow the trigger to work freely. It is well to put one of the small tins sometimes used in laying tar paper behind the trigger with the rounded side out. This will tend to let the trigger act more freely. The screw holding the trigger should be placed at a point about 5 $\frac{1}{2}$ inches from the bottom of the nest and 3 $\frac{1}{2}$ inches from the front.

The two cuts at the bottom of Fig. 193 show all the other dimensions of the nest. The backs are left open to facilitate cleaning, with the nests hung against the wall. If placed under the droppings boards the tops may be left open also. If used for a large flock the nests may be tiered up in rows, in which case only the top row would need to be covered as the bottom of one row of nests would be the covers for the row below.

To set the nests when the door is closed, insert the index finger beneath the door and depress the forward end of the trigger sufficiently to allow the door to open. Open the door until it rests in the notch of the trigger when the

FIG. 192—HEN IN NEST—DOOR CLOSED

rear end of the latter is raised. When a hen enters the nest she lifts the door slightly with her back, the trigger at once drops and the door swings shut. A small block is placed under the trigger at such a height that when the rear end of the trigger is resting upon it the front end is held at a point just above the lower edge of the door when closed. This prevents the door from opening inward to admit another hen until the occupant of the nest has been removed and her egg recorded. A stop is necessary in front of each door to prevent the door opening outward

doors. Whatever form of stop is used should be fastened to the partition between the nests in such a way that it will stop the door flush with the front of the partition. The key to the successful operation of the nest lies in the correct adjustment of the door and trigger.

MATERIALS REQUIRED FOR A SET OF THREE TRAP NESTS

Boards.....	2— $\frac{3}{4}$ x 9 inches, 7 feet long.
	1— $\frac{3}{4}$ x $8\frac{1}{2}$ inches, 3 feet long.
Furring.....	1— $\frac{3}{4}$ x 4 inches, 3 feet 4 inch long.
Wire.....	3— $\frac{3}{4}$ x 2 inches, 12 feet long.
Hoop iron.....	40 inches No. 3 or 9.
Nails.....	$\frac{3}{4}$ -inch, 6 feet long.
	$\frac{1}{2}$ pound 6d.

The "Gravity" Trap Nest

The trap nest illustrated in Figs. 194 and 195, is one of the simplest and easiest to operate. This nest can be made by anyone who is handy with tools. There are no triggers or special attachments to make or to get out of order.

It is 24 inches long, 12 to 14 inches wide and 12 inches high. The top of the nest is covered with poultry netting and the revolving door in front also is covered with 1-inch netting, or with galvanized wire cloth. The sides of the door, as will be seen in Fig. 195, are each made of a piece of $\frac{3}{8}$ -inch lumber. The circular face of the door is approximately one-third of a full circle and should measure $13\frac{1}{2}$ inches, while the straight edges should each measure $7\frac{1}{2}$ inches. The two sides of the door are fastened together at top and bottom by means of strips about $\frac{1}{2}$ x $1\frac{1}{2}$ inch. The door swings on screws that pass through small holes in the extreme back part of the door frame and are screwed into the sides of the nest.

Care must be taken to see that the door swings freely back and forth and is so balanced that when it is open a hen passing underneath will tip it forward. When the door is open, ready for use, it rests on a nail driven into the box, this nail being so placed that the door is just balanced when open. After the hen enters the nest she has to step onto or over a 4-inch strip

FIG. 193—PLANS FOR THE CONNECTICUT TRAP NEST

and thus allowing the hen to escape. This may consist of a screw hook bent over a small block of wood or one of the small iron buttons commonly used to fasten cupboard

FIG. 194—"GRAVITY" TRAP NEST WITH DOOR CLOSED
Photo from American School of Poultry Husbandry.

FIG. 195—CONSTRUCTION OF "GRAVITY" TRAP NEST

This section through side of nest shows dimensions, method of hanging door on screws, also location of nail which supports door when open. Hen in stepping over low board in front of nest lifts door and causes it to roll forward along dotted line. Original drawing from American School of Poultry Husbandry.

that is nailed across the bottom and forms the front of the nest proper. This raises her back so that it touches the door, which then gently rolls forward and closes behind her. With a little care in adjusting the door and securing a proper balance, the nest is accurate and dependable.

FEED TROUGHS AND HOPPERS

Troughs That Fowls Cannot Get Into. Hoppers That Prevent Wasting of Feed.

For feed troughs to be placed directly on the floor, the one shown in Fig. 198 is probably as good as any. It cannot readily be upset nor can the fowls get into it. It can be made in any length or width to meet individual requirements. A simple, easily made trough is shown in Fig. 196. It consists of ordinary galvanized eave troughing, preferably four or five inches wide, and nailed to suitable wooden supports. Bend the ends up to close them. Metal troughs are easy to clean and keep in sanitary condition.

FIG. 196—METAL FEED TROUGH

The wooden trough shown in Fig. 197 is easily and cheaply made. For adult fowls make it with a 6-inch board on the one side and a 7-inch board on the other in order to have both sides the same height. The divid-

FIG. 197—WOODEN FEED TROUGH WITH REMOVABLE DIVIDING BOARD

ing board is provided to keep the fowls from getting into the trough and soiling contents. The ends of this board are bevelled and slide in slots cut into the end pieces, making it easily removable for cleaning.

Feed Hoppers

For feeding dry mash or grain the hopper shown in Figs. 199 and 200 is highly recommended. This hopper is made three feet long, 13 inches wide and 20 inches high to top of roof. A hopper of this size will hold sufficient food for 40 to 60 adult fowls or growing stock for a week.

FIG. 198—METAL FEED TROUGH WITH DIVIDING BOARD

FIG. 199—GRAIN AND MASH HOPPER FOR INDOOR AND OUTDOOR USE

It is not essential that hoppers be filled full once a week. In practice it is found that it is well to fill them about half full; then keep an eye on them when going about to the coops with water, etc., and refill any that appear to be getting low.

It will be noticed also that the partition dividing the hopper into two compartments is not in the center. As a matter of fact, the partition is set over just half an inch from the exact center, so that the throat of the side containing the dry mash shall be an inch wider than the side containing whole or cracked grain. The dry mash

FIG. 200—CROSS SECTION OF GRAIN AND MASH HOPPER FOR INDOOR AND OUTDOOR USE

FIG. 201—SIMPLE HOPPER FOR DRY MASH FEEDING

FIG. 202—FEED HOPPER WITH THREE COMPARTMENTS

This easily constructed compartment feed hopper can be used for dry mash, grains, grit, oyster shells, charcoal, etc. Made with sloping top fowls cannot perch upon it. Reproduced from Cir. 26, Utah Agricultural College.

flows less freely than does grain, and the inch wider throat for the dry mash side is desirable to prevent its clogging.

In the drawing of a cross section of this hopper (Fig. 200) the bottom and ends are made of inch boards 13 inches wide and the sides and partitions are made of half-inch or five-eighth-inch boards. The partitions and roof can easily be made of a good roofing fabric, or of galvanized iron. When made of roofing fabric, half-inch strips of board should be tacked to the ends and bottom of the middle partition; then these strips of board are nailed to ends and bottom of hopper, holding the partition firmly in place. Two laths, one on each side, are then securely nailed to the top of the partition and they make the ridge-pole of the hopper.

The sloping partitions forming the two sides of this hopper are made similarly, excepting that a single lath, planed smooth so that the fowls' combs will not be scratched by the rough edges, is securely tacked along the lower outside edge of the partitions. A single lath is not stiff enough to hold the outward thrust of half a bushel of grain, therefore a piece of $\frac{1}{8}$ -inch wire (telephone wire) is cut the right length and bent over so it can be tacked to the hopper front with a couple of staples and will reach into the lath of the partitions. This will hold the partitions securely in place.

FIG. 203.
GREEN FEED
HOLDER

The slats forming the fronts are made of laths, planed smooth, and are nailed about two inches apart. Along the top of the front is nailed a lath, extending inward and slightly downward, as shown in Fig. 200. This makes a "lip" and tends to prevent the chicks from throwing out the food as they pick at it. A little grain will be thrown out probably, but they eat from the ground now and then, especially after a rain has soaked the grain, hence there is practically no waste.

The cover of the hopper is made sloping, just like a roof, and the eaves,

the eaves and the ridge to support the roofing fabric which makes the roof. The lath and eaves strips are let into the end pieces, so the roofing fabric nails closely down upon the ends. A hook and screw eye in the center of each end secures the roof in place so the wind cannot lift it.

A Simple Feed Hopper For Mash or Grain

One of the easiest feed hoppers to make and one that will give good satisfaction, is the one shown in Fig. 201. Use any convenient box—one with the dimensions indicated in the illustration, if available; or, if not, any other suitable size. Remove the top and trim enough off the edges to let it fit between the sides, then adjust it in the position of the dotted lines and nail fast. Make a hinged

cover, as shown; or, if increased size is no object, simply saw the upper end off with the proper slant and use the end thus secured for a cover. The hinges can be dispensed with, if preferred, nailing a cleat on the underside of the loose top near the front so that when it is in position it will be held in place by the cleat which rests against the upper edge of the sloping front. If the fowls waste the food by throwing it out over the front board, nail a piece of lath along the upper edge of the board, letting the lath extend in so as to form a lip which catches any food that may be thrown up by the fowls.

FIG. 204—A LOW-COST COMPARTMENT HOPPER

Compartment Hoppers

For small flocks a compartment hopper to hold several articles, such as grit, oyster shell and dry mash, often is wanted. The ones shown in Figs. 202 and 204 meet this need and are easily made. The number of compartments that may be provided will be determined to some extent by size of box. They should not be made so small that the contents will not feed down readily. The inside surfaces of all boards used in making hoppers should be smooth, as hoppers made of rough boards are apt to clog. The hopper shown in Fig. 204 will be improved by providing a "lip" on the front of the feeding section, extending inward, as shown in Fig. 200, which will prevent the fowls from throwing the contents out on the floor.

Green Feed Holder

A convenient means of supplying bulky green food, such as cabbage, mangels, vegetable leaves, etc., is by the

An Automatic Feeder

There is always more or less demand for an automatic feeder that will meet the requirements of the back-yard poultryman who must be absent from home at the time when the fowls should have their grain feed. This is especially liable to be the case in the evening. Probably the great majority of shop and office workers in this country do not get home from work until after dark, during the winter months, and it is not always possible to have someone else to do the feeding, and do it just the way it should be done. The automatic feeder illustrated in Fig. 205 was devised by C. C. Holmes as a means of insuring that the hens shall get their meals on time. It is comparatively inexpensive and simple in construction, and should answer the purpose in a very satisfactory manner. The following directions for making this feeder are supplied by Mr. Holmes.

Feed—Take an inch board nine inches wide and 18 inches long. Cut hole two inches square through board $4\frac{1}{2}$ inches from end and sides of board to center of hole. This affords an opening through which the grain passes onto the spreader after the hinged door has been liberated by the trigger.

Hinged Door—To be constructed similar to the cover on a tobacco box, and secured to bottom of board in such position as to entirely cover hole.

Trigger—After hinged door has been placed, the trigger is to be located so as to hang plumb, the notch

to project slightly over the edge of hinged door. Cut narrow slot through board long enough to allow trigger to move backward and forward freely. Where trigger passes through top of board make a small hole, through which put a nail and secure same to top of board with a staple at each end. Trigger can be made of metal or wood, with small hole to fasten string.

Hopper—To be eight inches square and such height as may be required, the bottom portion to be cut and bent in, so as to form a two-inch square opening at bottom of hopper. At each corner of hopper solder metal standards of proper length, bent at bottom to receive screw. Place

FIG. 205—THE HOLMES AUTOMATIC POULTRY FEEDER

use of an open mesh holder like the one shown in Fig. 203. It may be made of loosely-woven cord, or of 2-inch mesh poultry netting. Suspended from ceiling or rafter at a suitable height, so that the fowls will have to make some effort to reach it, this feeder not only protects the contents from being soiled or wasted, but also promotes

healthful exercise. Pieces of meat, butcher's scraps, etc., may also be fed in this way.

FIG. 206—CONVENIENT MASH PAIL

FIG. 207—PLATFORM FOR WATER DISH

FIG. 208—WATERING PLATFORM, PAIL HOLDER

two-inch square hole in hopper directly over hole in board and secure same by screwing standards to top of board. The lid of hopper is to be made similar to hinged door on bottom of board.

Spreader—To be made of metal, conical in shape, and 12 inches in diameter at base, suspended with wire hangers soldered to spreader and screwed to bottom of board. Hangers are to be of proper length to suspend spreader low enough to clear hinged door when open.

Clock—An ordinary alarm clock is then placed in such a position that it brings the center of spool over center of board. After clock has been securely

FIG. 209—TROLLEY FEED CARRIER

fastened with metal strap, which is bent over top of clock and screwed at each end to top of board, plumb down from side of spool and bore hole through which string passes. On bottom of board under hole place small wooden pulley around which string passes from spool to trigger.

Spool—To be secured to alarm winder in a substantial manner by welding a short shaft to winder over which slip spool and secure with set screw.

Finally—Wind clock and set at correct time, then give spool (alarm) about two turns after setting alarm for the desired time you wish to feed. When the hour comes you have set your alarm for, the spool will turn, winding up

the string which pulls the trigger and liberates the hinged door. The grain then falls upon the spreader and scatters in all directions. The feeder is to be hung from ceiling of poultry house near roof, or can be suspended out of doors if so desired. The birds will soon become familiar with the ringing of the alarm and know it is time for the meal.

MISCELLANEOUS EQUIPMENT

Various Handy Devices for Making the Poultry Work Lighter, and Saving Time.

A Mash Pail.

Where mash is to be fed, either wet or dry, a pail with a hood that will keep the mash from spilling will be found a decided convenience. Such a pail in shown in Fig. 206 and can be used in filling hoppers or pouring mash into troughs without having any of the contents wasted.

FIG. 211—CROSS SECTION OF WATERING PLATFORM

A Trolley Feed Carrier

In long compartment houses a trolley by means of which feed, litter, droppings, etc., can be conveyed back and forth, relieves the caretaker of much hard work. The carrier illustrated in Fig. 210 runs on a wire cable and is provided with a grapple by which feed box, barrels for droppings, bales of straw, etc., are readily picked up and pushed along to their destination with a minimum of effort. Where trolleys are used, the partition doors generally are made in pairs and hung on double-action spring hinges, the carrier pushing them open without special attention from the attendant.

Fig. 209 shows another method of installing trolleys, using 2x4 timbers to form the track and suspending these on metal stirrups. The box shown in illustration is held by hooks which can readily be disengaged and used in handling other loads.

FIG. 210—TROLLEY ON WIRE CABLE

FIG. 212—HOME-MADE OATS SPROUTER

Photo from Purdue University.

Water Vessels

Water vessels may be of metal or earthenware, but should never be of wood. Earthenware is liable to be broken by dropping or freezing, but with careful handling will last a long time and is fairly cheap. Galvanized ware is usually preferred and where the flocks are large may consist of plain 10 or 12-quart pails supported as in Figs. 208 and 211. The platform should be wide enough to allow the fowls to stand and drink on three sides and the hole in which the pail fits should be just large enough to hold the pail about one-third above the platform, which gives the fowls easy access to it, and prevents it being tipped over. The stand should be high enough so that litter will not be liable to be scratched into the water. For small flocks and for use in the alleyway shown in Fig. 181, one or one and one-half gallon crocks with straight sides are very satisfactory. If to be used inside the pens, a slatted platform should be provided as illustrated in Fig. 207.

For winter use various types of "nonfreezing" water fountains are made. In extremely cold climates the most practical plan is to use heated fountains. These are provided with a small lamp underneath the water vessel, which keeps the water well above freezing temperature and requires only a limited amount of kerosene for the purpose. Small oil heaters or stoves are available for those who wish to provide homemade devices. It is not desirable to use anything that supplies much heat, nor should lamps with glass bowls or chimneys ever be used. Especial care should be taken with all such appliances to avoid danger of fire.

Where the cold is not too severe, it is possible to utilize the "fireless cooker" principle in protecting the water so that it will remain free from ice for a number of hours at least. For this purpose an ordinary galvanized pail of suitable size may be used providing for it a wooden enclosure to be packed with newspapers, chaff, planer shavings or similar material. The enclosure should be large enough so that the pail may be surrounded by an insulating layer two to three inches in thickness. If properly made, the water vessel can be removed for emptying or cleaning without disturbing the insulating material. So protected, a pail filled with warm water in the morning should keep free from ice all day long, unless the temperature drops extremely low.

Hook for Catching Fowls

For catching individual fowls nothing is better than a crook similar to a shepherd's crook. It may be easily and cheaply made

of heavy galvanized wire. Use about $5\frac{1}{2}$ feet of wire so that when the crook (about six inches long) has been turned on one end and a loop for the handle on the other, the finished implement will be at least 4 feet long. The crook should be left wide enough so that it may be heavily wrapped with cloth or adhesive tape to protect

FIG. 213—DOOR FASTENER

FIG. 214—PORTABLE DUST BOX

the fowls' legs from injury. A loop of lighter wire may be used, attaching it to a wooden handle, but it is difficult to fasten it securely in place and an all-wire crook is not so easily seen and hence will disturb the fowls less.

Home-Made Appliances

There are various appliances that may be made from empty cans, tin boxes, etc., which will answer the purpose almost as well as the more expensive ones purchased at the poultry supply store. It is an easy matter to overdo the matter in practicing economy by the use of such devices, however. The true test in every case is not how much can be saved in first cost by the substitution of home-made articles for manufactured ones, but whether they are as good, as nearly wasteproof, and as convenient. If not, then it will pay better in the long run to spend a little money and have equipment that will really answer the purpose and save feed and time. However, the handy poultryman can make grit and shell boxes, watering founts, etc., from waste boxes and cans, which may answer fully as well as manufactured appliances.

Handy Door Fastener

The simple, inexpensive door and gate fastener shown in Fig. 213 will prove very convenient under many conditions. It consists simply of a wedge-shaped wooden block nailed to gate post or door frame and adjusted in width so that when the door or gate swings shut it will bind on the surface of the wedge and will be held securely until it receives a strong push or pull. On a partition door or small gate, place it low enough so that the foot can be used in pushing the door open.

A Portable Dust Bath

This dust bath (Fig. 214) is made from any convenient box, with a barrel hoop for a handle, and four pieces of wood for legs. Make it about 12 inches deep and not less than 2 feet square, and set it in a sunny place in the house, when the fowls cannot get out, and see how quickly they will discover what it is meant for.

A Safe Way to Poison Rats and Mice

The difficulty of using rat poison about poultry houses without endangering the fowls, can be entirely overcome by providing the appliance illustrated in Fig. 216, particularly if the poison is mixed with corn meal so that

the rodents cannot carry it out. A convenient size for the box is about 12x12 inches and 6 inches high. However, the dimensions are of no special importance. The top of the box should be removable, but must be fastened securely in place with hinges, hooks, or otherwise, so that it cannot be accidentally displaced. Provide a number of 1½-inch holes along the lower edge as shown. The small tin box, indicated by dotted lines, which is to contain the poisoned food, is to be nailed securely in the center of the bottom.

The trap is regularly baited with a mixture of one-third sugar of lead and two-thirds corn meal. It has proved quite successful in the extermination of these pests. No poultry keeper whose premises are infested with rats can afford to let up in the warfare against them. Provide as many of these safety poisoning devices as necessary and keep them baited at all times.

OAT SPROUTING EQUIPMENT

Sprouted Oats Are Unequalled As Green Feed for Fowls.

**Convenient Plans for Making Oat Sprouters,
With or Without Heat.**

Sprouted oats form one of the best sources of green food and almost every poultry plant these days needs some arrangement for producing them. Where large quantities of oats are to be sprouted it is better to have a separate room for the purpose so that temperature and other conditions may be exactly controlled.

FIG. 215—HOME-MADE OATS SPROUTER WITH LAMP COMPARTMENT

*Put poison mixed with corn meal in the tin box placed under the larger wood box.
Cut holes about 1½ inch high*

FIG. 216—SAFETY RAT POISONING DEVICE

To succeed with oat sprouting in winter requires a fairly warm room, and to economize floor space, racks or cabinets with shallow sliding trays should be provided, as illustrated in Figs. 212 and 217. Shallow galvanized iron trays 22x26 inches and one inch deep should be provided. These are kept on racks with about eight inches between each tray, as illustrated herewith. Holes are punched in the bottoms of the pans so that the surplus water used in sprinkling can drain away. Instead of galvanized pans, fine-mesh wire netting can be used for the bottoms of wooden trays, or wooden bottoms may be used. The use of wooden trays, however, is not recommended on account of the difficulty of keeping them sweet and free from mold. Soaked oats are liable to sour and mold if the trays are moldy, and for that reason galvanized iron trays, which may be thoroughly washed and disinfected after each using, are much more satisfactory.

Soak the oats over night, then put in a coarse sack and drain, after which they are spread in the pans to a depth of one-half to three-fourths of an inch. They should be sprinkled daily with tepid water, and in four to ten days are ready to feed, depending on the temperature of the room. Some light is needed for sprouting oats properly, but not direct sunlight. A fairly well-lighted basement or cellar answers nicely.

Inexperienced persons in sprouting oats spread them out an inch or an inch and a half deep. Where this is done many of the oats will smother and fail to sprout, and there is also more danger of mold. If spread only one-half inch in depth they will sprout rapidly and be in much better condition. The chief difficulty in sprouting oats is to prevent mold. Moldy food of any kind is unfit for poultry feeding and sprouted oats are no exception to the rule. If oats are spread only one-half inch thick, sufficient warmth supplied, and care taken to clean thoroughly and sun the sprouting pans and buckets used in soaking, there should be no trouble from this source.

As an additional precaution against mold, a solution made by adding one ounce of formalin to four gallons of water will be found effective. The dry oats should be sprinkled with this solution until wet enough to pack in the hand. They then should be spread out two or three inches deep on the floor or in trays or boxes and covered with cloth or bagging for two hours, after which they may be uncovered and allowed to dry before soaking for sprouting. Buckets and trays should be washed with the formalin each time they are used.

Circular 37 of Purdue (Indiana) Experiment Station illustrates and describes a cheap, easily made oat sprouter (see Fig. 212) that will provide sufficient green food for a good-sized flock. It can be made to take trays of the dimensions previously described or modified to meet any special requirements. This sprouter can be located in any convenient building or room and for cold weather it is entirely practical to enclose it and provide a small lamp or lantern underneath to get proper warmth for germination.

A Lamp Heated Oat Sprouter

Where only a comparatively small number of fowls are to be provided for and the oats must be sprouted in

a cold house or room, the lamp-heated sprouter shown in Fig. 215 is particularly convenient. The cabinet can be made in any desired size, making the trays as directed for the oat sprouting room described on page 102, but graduating the spacing for the trays as indicated in the illustration. Under the trays a water-tight drawer is provided and a ventilated lamp chamber underneath. Use a lamp or small oil stove and regulate the flame so that the temperature in the cabinet will be about 70 to 75 degrees, and the oats will grow rapidly. In order to avoid mold, the trays and the entire inside chamber should be thoroughly disinfected at frequent intervals. Formalin

FIG. 217—A CORNER IN AN OAT SPROUTING ROOM

solution is excellent for the purpose, spraying or mopping all inside surfaces.

Illuminating Poultry Houses

The illumination of poultry houses in winter months with a view to increasing egg yields is receiving much attention at the present time. One of the main difficulties in securing good winter production appears to be the shortness of the hen's working day. Short days reduce her time for eating, also her time for digestion and assimilation. In mid-winter when the fowls go to roost at four or half-past four in the afternoon and remain until seven or eight in the morning, comparatively little of the day is left for eating, laying, etc., and the extremely long fast through the night clearly must cut down food consumption.

Experiments made by practical poultry keepers have shown that artificially lighting the poultry house for a few hours, morning and evening, so that the fowls have daylight or its equivalent for twelve to fourteen hours out of the twenty-four, regularly results in a marked increase in egg production, other conditions being favorable. Similar results have been secured at certain of our Agricultural Experiment Stations, particularly at Cornell University, where the subject is being carefully investigated and where striking results in favor of illumination have been secured. The advantage in the method appears to be due to the fact that with a longer day the fowls have more time for eating and digesting the large amount of food essential to heavy production. They must have not only sufficient food to maintain their physical well-being, to keep up or increase their flesh, and to furnish fuel for warmth on cold winter days, but they also must consume a sufficient amount of food in addition, to furnish ample material for the formation of eggs.

The following is an illustration given by Professor Rice of Cornell, showing the results obtained by a New York State poultryman who kept an accurate record of results secured with a flock in an illuminated house and, for comparison, the record of a similar flock without illumination:

PRODUCTION OF ONE HUNDRED HENS IN UNLIGHTED HOUSE

	Eggs Laid	March Price	
		Per Doz.	Receipts
December	14	\$.69	\$.82
January	154	.71	21.12
February	430	.57	20.10
March	841	.43	44.35
April	1401	.43	42.35
May	1605	.38	42.14
June	792	.43	28.38
Total	4362		\$176.00

PRODUCTION OF ONE HUNDRED HENS IN ILLUMINATED HOUSE

	Eggs Laid	March Price	
		Per Doz.	Receipts
December	1410	\$.69	\$51.08
January	780	.71	46.15
February	548	.57	26.90
March	453	.43	17.23
April	451	.43	14.25
May	771	.38	25.04
June	704	.43	25.20
Total	4286		\$235.90

This experiment and numerous others of a similar character clearly prove that by this method the poultryman can get more high-priced eggs from his fowls by the use of lights. It seems to be clearly established that illumination does not actually increase the number of eggs laid by hens in a season, but it changes the time of laying or advances production from the low-price months of spring to the high-price months of early winter. In other words, the poultryman may not get more eggs in number by this method, but he should get them at the time when they bring the most money.

Where electric lights are available, poultry houses can be lighted conveniently and with little expense. The size and number of bulbs to be used are determined by the amount of light needed properly to illuminate the house or pen. They should be located where they will light the house to best advantage. It is usual to provide a low-powered bulb as well as a high-powered one, so that when the bright light is turned off there will still be sufficient light for the fowls to find their way readily to roost. Numerous poultry keepers who do not have electricity are reporting good results with acetylene, gas and gasoline lights.

Exterior Fixtures and General Equipment

Advantages of Double Yarding for Fowls—How to Plan Yards, Build Fences, Etc.—How to Keep Yards Clean and Free From Disease Germs—Outdoor Feed Hoppers—Feed Wagon—Brood Coop—Labor-Saving Method of Supplying Water on Range—Providing Shade—Other Special Poultry Plant Equipment.

OUTDOOR runs are provided chiefly to afford fowls a means of securing plenty of healthful exercise in the open air, and in a general way are regarded as indispensable to successful and profitable poultry keeping. It is true that many back-yard flocks are kept confined to their houses the year around and with excellent results and, of course, yards have little value in the north, in winter weather. Nevertheless, the advantages of having outdoor runs of ample size are so great that few poultry keepers care to dispense with them except with quite small flocks or for a limited time.

One important advantage afforded by runs or yards, though it often is overlooked or neglected, is the opportunity to produce green food for the hens. A growing crop, properly managed, not only provides a continuous supply of this healthful and economical part of the ration, but by using up the accumulating fertility keeps the ground in a wholesome condition and lessens the danger from disease. Bare, unproductive poultry yards ought to be regarded as inexcusable unless they are necessarily so small that it is impossible to keep anything green growing in them.

The amount of yard room that should be provided per fowl cannot be arbitrarily fixed. A little is better than none; and a good deal is better than a little. The only general rule that can be given is to provide as much as possible, remembering, however, that the cost of fencing large yards amounts to a considerable figure, and obviously there are limits beyond which it is not practical to extend them. Under most conditions one hundred square feet per hen, divided into two runs of equal size and used alternately, will keep them in green food throughout the entire growing season. But the same amount of ground in one yard to which the fowls have access at all times, will soon be picked off so close that the growth will be killed and the ground left bare.

Wherever practicable the runs should be made large enough and be so fenced that they can be cultivated by horsepower. Spading is a tedious and laborious operation and, while it must be resorted to with small yards, it is always a handicap, and the necessity for doing it should be avoided if possible. Small yards cost much more in proportion to the amount of land enclosed.

A satisfactory arrangement of runs for the laying or breeding flock is illustrated in Fig. 218, in which the house is shown between two runs, one on the north and the other on the south side. The width of the yard is determined in this case by the width of the house pen, but it can be as long as necessary or as the limits of available land make possible. In the case of a continuous house the gates in the yard fence next the house should always be made wide enough for the passage of a team so that, in cultivating, the horses can turn from one yard into the next instead of having to make a complete turn

in the same yard, which usually results in much injury to the fencing.

Fig. 220 shows another double-yarding plan that often can be utilized to good advantage where only a limited amount of land is available. In carrying out this plan, each pen is provided with a small outdoor yard on which no attempt is made to keep anything growing except, possibly, one or two trees which will afford agreeable shade in hot weather. Adjoining these small yards are large runs occupying all the rest of the available ground and planted to a suitable growing crop. The hens are given access to the small yards at all times, but are allowed to have access to the large runs only when the crop is in proper condition for their use. It is generally understood that fowls, if allowed to overrun a small plot of green stuff, will soon kill it off, whereas if they are only given access to it for a limited time, the plants will keep growing right along and will furnish a constant supply of green food, week after week. This method of yarding

FIG. 218—DOUBLE YARD PLAN FOR SINGLE OR COMPARTMENT HOUSE

calls for more fencing and more gates than the plan indicated in Fig. 218, but it is well adapted to the conditions of the back-lotter, and of small producers generally. Another double-yarding method, where the yards can be any desired width regardless of the width of the house, is illustrated in Fig. 219.

BUILDING POULTRY FENCES

Directions for Putting Up Wire Fence, That Will Make the Work Much Easier.

In building permanent poultry fences it pays to use only the best materials. Fence building is an expensive matter at best, on account of the amount of labor required, and if poor material is used or the work carelessly done, the final cost is greatly increased. If wooden posts are used, black locust, catalpa, cedar, and chestnut are the most durable of the timbers generally available. It will pay to give the lower end of all posts a coating of creosote or hot tar before setting them in the ground. Where sand and stone or gravel are available, concrete posts are cheapest in the long run. Even though the line posts are of wood it pays to make gate, end, and corner posts of concrete. It is not a serious matter to replace

FIG. 219—DOUBLE YARDING METHOD FOR LARGE YARDS

an ordinary line post, but with wire fences, the failure of an end post lets the entire fence down and stretching it a second time may be more difficult than at first. The corner and gate posts should always be larger and set deeper than the regular posts and should be well braced so that they will stand any strain to which they may be subjected.

In the purchase of poultry fencing there is only one injunction that can be given and that is to get the best obtainable. Ordinary hexagonal netting, if well galvanized after weaving (not before), generally will last quite well, but it is difficult to stretch it evenly, especially where the fence is to be built on irregular ground. There are other kinds of poultry fencing that will stretch better and possibly last longer, but unfortunately the weight of the fence or the thickness of the wire is no indication of quality, as some comparatively heavy fencing is so lightly galvanized that it rusts out in much less time than lighter wire that is heavily galvanized.

Stretch the fence carefully, using a good stretcher, which usually can be secured from the dealer who supplies the fencing, if the poultryman does not have enough of such work to warrant owning one of his own. Where the fence must be stretched without a regular fence stretcher the following method, described by Don Harrison, may be used in putting it up:

"Among the methods employed for putting up poultry netting, I have found no way which is so expeditious and in every way satisfactory, as the following:

"Nail the boards on which you intend to fasten the bottom of the netting in such a manner as to form a straight line, as netting cannot be nicely put up over a line, one part of which is higher than the rest, without cutting and lapping the netting. Have the posts extend at least 4 feet 4 inches above the top of the boards.

"Now drive six-penny nails about $\frac{1}{2}$ -inch into the posts 4 feet from the board. Next loosen the roll of netting and run a slender stick lengthwise through the center. I use a measuring stick 8 feet long. Have two persons take hold of the ends of the pole and walk as near the posts as possible, thereby causing the netting to unroll. Now your netting lies flat on the ground. Get on the opposite side of the fence with staple and hammer, and staple the selvage strand to the top or edge of the board, pulling the wire just enough to take out the kinks. Do not try to stretch it. Now one edge of the netting is fastened to the base board and the other edge lies about 4 feet from you on the ground. Pick up the free edge and hook it over the nails previously driven in the posts. Fasten the ends of the netting to their respective posts,

FIG. 221—FEED AND WATER WAGON FOR SERVING COLONY FLOCKS

Where fowls are kept in small colony flocks more or less scattered over the fields, a convenient low-down wagon or truck is a great convenience. The wagon here shown on Poultry Plant of Cornell University, carries a water barrel provided with a hose and faucet, a box for feed and a milk can in which a supply of sour milk may be carried, and a pail for distributing feed and water when needed. There is room on the truck also for supplies of charcoal, grit, oyster shell, etc.

FIG. 220—PRACTICAL DOUBLE YARDING METHOD WHEN SPACE IS LIMITED
Photo from N. J. College of Agriculture.

FIG. 222—CONVENIENT END GATES FOR POULTRY YARDS

pulling fairly taut and fastening securely. Make a notch on the end of your pole deep enough to hold the selvage. With this pole push the netting up on the post, having pulled the nail when you attached the pole, until the netting is firm and straight. Staple the selvage wire to the post, repeating the operation on each post. After you have done this, staple to the post as much as you think necessary. I use two staples between selvages, making four to each post, and as for the bottom I staple every 2 feet.

"With a boy to help unroll the netting, you can put up a roll in twenty minutes. Our yards are on level ground and we have posts sawed 3 by 3 inches and 8 feet 4 inches long. We drive them 2 feet into the ground and put two 12-inch boards at the bottom to prevent the males from fighting."

Where the yards are to be used by breeding flocks it is always desirable to make the first two feet solid as described by Mr. Harrison. For ordinary laying flocks this is not imperative, and as this method of construction adds considerable to the cost it is customary to use only one 10 or 12-inch board which is needed in order to have a substantial base to which the bottom wire or selvage can be securely stapled. Wire fences usually require posts about every 16 feet with a short post between each to support the middle of the base board and keep it from warping.

It is always desirable to make ample provision for getting the plow team into and out of the yards. Where the yards are narrow the plan of having the end of the yards closed with one big gate, as in Fig. 222, is a good one. With these gates open the team can be taken into the yard for plowing, turning it in the open space at the foot of the yard. If the yards are connected at the other end with wide gates so that the team can turn through into an adjoining yard instead of having to make a complete turn in one yard, it is possible to plow and cultivate quite narrow runs with comparatively little difficulty.

Gate Fastener

A simple and effective gate fastener is shown in Fig. 223, which any

blacksmith can make in a few moments' time. It consists of a strip of strap iron about $\frac{1}{2}$ -inch wide and bent in the shape of a U with the stem long enough to extend over the gate as shown. In the closed end a plain iron ring $1\frac{1}{2}$ to 2 inches in diameter is hung loosely on a rivet and the whole device is screwed firmly to the gate post. The ring drops down on the rivet and in this position will hold the gate securely so that it can not be opened until the ring is raised by hand. With a little trimming on the inside edge of the top rail of the gate the ring will automatically raise up as the gate swings shut and then will promptly drop into place again.

Yard Tools

Small yards should be cleaned and spaded at frequent intervals in order to keep them free from accumulations of filth. Many careful poultry keepers make it a practice to sweep small yards once a week, for which purpose there is nothing better than a fibre brush like the one shown in Fig. 224. Where this attention is given, the yards will look better, smell better and keep in much more wholesome condition.

Once a month is not too often to spade the yards if they are quite small. It is not necessary to do all the spading at once, but a spading fork like the one shown in Fig. 224 should be kept handy and a small portion of the ground spaded from day to day. The fowls will appreciate the worms that will be turned up, and if the practice is formed of sprinkling a small amount of grain over the ground before spading (oats are excellent for this pur-

FIG. 223.
SIMPLE GATE
FASTENER

FIG. 224—BROOM AND SPADING FORK FOR KEEPING YARDS CLEAN

FIG. 225—OUTDOOR GREEN FOOD PROTECTOR

pose) the fowls will get double enjoyment out of it. If they do not find some of the grain until after it sprouts, so much the better.

FIG. 226—A COOL SPOT ON A HOT DAY

Green Food Protector

In small yards it often is desirable to use a frame such as is shown in Fig. 225 for protecting small plots of green stuff so that the fowls can help themselves to the leaves when they reach the proper height, but which will keep them from trampling over the plants, scratching them out or killing them off by picking out the tender green hearts as they almost invariably do when given the opportunity. Make the frame of any convenient size, using boards 6 to 8 inches wide for the sides and covering with 1-inch poultry netting, using sufficient cross pieces to hold the wire at the proper height.

Shade for Bare Yards

It is not as clearly understood as it should be that fowls and chicks suffer greatly from extreme heat—more so, perhaps, than from cold, and it is not only an act of humanity, but a source of added profit as well, to provide for their comfort during the hot weather by seeing to it that they have plenty of shade. Where there is no natural shade it is necessary to provide it in some artificial manner. Almost anything will answer, though in permanent yards it pays to set up substantial shelters, such as the one shown in Fig. 226. These shelters should be

considered merely temporary however, every effort being made to get some fruit trees growing in the yards as soon as possible. Fruit trees provide the best of shade and will soon prove a source of additional income as well.

MISCELLANEOUS OUTSIDE EQUIPMENT

Omit None of These Articles of Equipment That Can Be Used to Good Advantage. They Save Time and Strength.

It does not pay to abuse broody hens; neither does it pay to allow them to continue sitting indefinitely before breaking them up. If taken in hand as soon as broodi-

FIG. 227—OUTDOOR COOP FOR BROODING HENS

ness develops they can be broken up more quickly and will be ready to start laying again in much shorter time than will be the case if they are allowed to sit for several days before being placed in confinement. The best way to break them up is to confine them to a suitable coop such as the one shown in Fig. 227.

In warm weather it is more satisfactory, as a rule, to have the broody hens confined to these outdoor coops rather than indoor coops such as are illustrated on page 91. This outdoor coop is used and recommended by the Missouri State Poultry Experiment Station, and its

FIG. 228—OUTDOOR FEED HOPPER

Photo from United States Department of Agriculture.

construction is easily understood from the illustration. The bottom is slatted so that the fowls cannot sit on the floor and so that the droppings will fall to the ground, thus avoiding the necessity for frequent cleaning. The top is made movable so that it can be lifted off to change the hens or to clean and disinfect when that becomes necessary. If placed under a tree or open shed the hens will be quite comfortable, and if well fed will soon be ready to resume laying again.

Labor-Saving Watering Device

Where large numbers of fowls are to be watered, and a water tap is available, a convenient, labor-saving method

FIG. 229—A LABOR SAVING WATERING DEVICE

is to provide a barrel with an ordinary wooden faucet near the bottom, arranged to drip into an earthenware crock, galvanized pan, or trough of suitable size (see Fig. 229), from which the fowls drink. The barrel is filled by means of a hose and the faucet is set to drip just fast enough to meet the requirements of the fowls. Where water has to be hauled and waste must be avoided it is practicable to use a regular hog-watering device which is attached to the bottom of a barrel, or a suitable tank, and provided with a float by means of which a fresh supply is turned on whenever the water in the drinking cup is lowered to a certain level.

Outdoor Feed Hopper

The feed hopper for grain and mash, illustrated in Fig. 228 is especially designed for outdoor use. It can be made in any desired size, but for use on the range should be large enough to hold two or three weeks' supply of feed at a time in order to avoid frequent refilling. The compartments can be adjusted as to number and size according to individual requirements. The extended sides and top protect the feed trough from both wind and rain, and the top is covered with a good grade of prepared roofing. Top is fastened in place with hooks so that it cannot blow off. In illustration, one side of roof is unhooked and set aside to show interior construction and the middle supports that prevent roof from bending out of shape.

A Box for Carrying Fowls

Another useful, in fact almost indispensable article around the poultry yard, is a carrying box or crate. It often is necessary, especially where one is somewhat

cramped for room, to change young stock from one yard or house to another, separate pullets from cockerels, or double up yards in order to make room for others. Without a carrying crate the poultryman is obliged to carry the fowls by the legs, five or six at a time, which not only tends to make them wild, but there is danger of injuring many fine birds. With this crate, which has a small door or a loose lath in the top, a dozen or more can be caught at a time and transferred wherever they are wanted, and this can be done quietly and rapidly without injury to the birds and with much less labor than carrying them in the usual way.

FIG. 230—KNAPSACK SPRAYER FOR DISINFECTING AND GENERAL SPRAYING

A Sparrow Trap

In many localities sparrows are a source of continual loss to poultry keepers. Often clouds of them will regularly visit outside feeding places, especially where chicks are fed, and will go through inch-mesh window netting, to get at indoor feed hoppers. As poisoning is unsafe because of the danger to fowls, about the only means of exterminating them is by the use of traps. The one shown in Fig. 232 is practical and convenient.

This trap is made of galvanized wire cloth, or half inch poultry netting. As here illustrated is about a yard in length, and 15 to 18 inches high and wide. The ends of the trap are bent in as shown, and provided with a 3-inch hole next to the ground. About this hole sharpened wire spurs are bent in so that while the birds have no trouble in passing through, it is impossible for them to fly out again. The white spot near the center of the trap is a piece of bread, used as bait. This trap is to be set on the ground on the lawn or in the poultry yard, and its efficiency will be increased if two or three sparrows always are left in it as decoys.

FIG. 231—SIMPLE CARRYING CRATE FOR FOWLS

Wheelbarrows and Carts

A good wheelbarrow is an essential article of equipment on every poultry plant, and there is no economy in trying to get along without it. One with a flat bottom and removable sides is much better adapted to the poultry keeper's requirements than the cheaper kind with sloping bottom made for handling dirt, sand, etc. Hand-

FIG. 232—SPARROW TRAP
Photo from Rural New Yorker.

ling feed, litter, droppings, etc., in this way saves a great deal of hard labor. For this reason all doors and gates should be so planned as to make the use of a wheelbarrow possible. Generally where there are baseboards running under doors, these should be movable and held in place by cleats or otherwise, so that they can be taken out when necessary.

Under many conditions a two-wheeled push cart will be found very convenient, as it requires less labor than handling a similar weight on a wheelbarrow. If only one of these implements can be provided, the latter will be more generally useful, but the cart also is very desirable and on larger poultry plants should always form a regular part of the equipment.

Sprayers for Disinfecting and Whitewashing

Every poultry plant should be provided with some convenient means of spraying disinfectants, also for whitewashing. It is not only much more convenient to do this work with a sprayer than by the use of a brush, but the work can be more thoroughly done. For use about the poultry house the hand-sprayer shown in Fig. 233, or the knapsack sprayer shown in Fig. 230, are practical, and low enough in cost so that everyone who keeps fowls can afford to have them. For large poultry plants, barrel outfits such as shown in Fig. 234 will be found more powerful and rapid. These sprayers serve a double purpose since every poultry keeper has or should have various fruit crops

growing on the land and these require regular spraying in order to give best results.

The Use of Disinfectants

Disinfection should be looked upon as a preventive—as insurance against disease, rather than a remedy to be resorted to after disease has broken out. This important detail of poultry work usually is greatly neglected on the average poultry plant however, because, as ordinarily done, it is a laborious and most unpleasant job. The best way to guard against neglecting it is to make it as easy and as convenient as possible to do the work. Get a good spraying outfit and keep suitable spraying materials on hand, mixed ready for instant use.

Whitewash. For fences, small coops, runs, etc., also for interiors, whitewash is desirable and low in cost. With the spraying outfit shown in Fig. 234, it can be easily and quickly applied. Whitewash brightens up dark interiors surprisingly, but as usually made and applied, it rubs off readily and scales, so that a house whitewashed a few times presents a decidedly unattractive appearance unless thoroughly scraped and cleaned, which few persons ever take the trouble to do. For use with sprayers, whitewash must be carefully strained and it is desirable to have a special non-clogging nozzle. Formulas and directions for making whitewash will be found on pages 23 and 24.

Fumigation. This method of disinfection is effective only when the building to be treated can be tightly closed so that the interior may be subjected to the ac-

FIG. 234—BARREL SPRAYERS FOR WHITEWASH AND OTHER DISINFECTANTS

tion of the fumes for a period of several hours, which rarely is possible in the case of poultry houses. For exterminating red mites carbon disulphide often is used in small buildings and coops with excellent results, but for combating disease germs fumigation is of little practical value in the average poultry house.

Disinfectants. The various coal tar disinfectants on the market are excellent for all disinfecting purposes. They are comparatively cheap and are easily prepared, as it is only necessary to add the proper amount of water to the disinfectant as purchased. Coal tar disinfectants are effective against lice and mites as well as disease germs, and if used frequently about the perches, nests, etc., these pests will never make any serious trouble.

If for any reason the poultry keeper desires to make his own disinfecting solution, he cannot do better than provide the "cresol disinfectant" which is highly recommended by the Maine Experiment Station. The method for making this is described in Bulletin 179, as follows:

"The active base of cresol soap disinfecting solution is commercial cresol. This is a thick, sirupy fluid varying in color in different lots from nearly a colorless fluid to dark brown. It does not mix readily with water

FIG. 233—HAND SPRAYERS FOR DISINFECTANTS

and, therefore, in order to make a satisfactory dilute solution, it is necessary first to incorporate the cresol with some substance like soap which will mix with water and will carry the cresol over into the mixture. The commercial cresol, as it is obtained, is a corrosive substance, being in this respect not unlike carboic acid. It should, of course, be handled with great care and the pure cresol should not be allowed to come in contact with the skin. If it does so accidentally, the spot should be immediately washed off with plenty of clean water.

Measure out 3 1-5 quarts of raw linseed oil in a 4 or 5-gallon stone crock; then weigh out in a dish 1 lb. 6 oz. of commercial lye or "Rabbit's potash." Dissolve this lye in as little water as will completely dissolve it. Start with ½ pint of water, and if this will not dissolve

a clear watery fluid it can be used in spray pumps without difficulty. For disinfecting brooders or incubators which there is reason to believe have been particularly liable to infection with the germs of white diarrhea or other diseases, the cresol may be used in double strength, and applied with a scrub brush in addition to the spray.

A CREMATORY

Dispose of All Dead Chicks and Fowls By Burning Them, and Thus Avoid the Spread of Disease.

By DR. RAYMOND PEARL*

On every poultry plant and around every farm there is bound to occur, from time to time, a greater or less number of deaths of chicks and adult fowls from disease or other natural causes. The only really sanitary method of dealing with these dead bodies is to incinerate them. The difficulty of doing this is that the poultryman or farmer usually does not have any suitable source of heat ready at all times. To meet this requirement there has recently been devised the small crematory here described, and illustrated in Fig. 235. This crematory consists of a cement base or fire box, bearing on its top a series of grate bars which in turn are covered by a cremating box or oven in which the material to be incinerated is placed. The crematory here described is large enough to take care of all the needs of a plant carrying 1,000 head of adult stock, raising 3,000 to 4,000 chickens annually and in which a good deal of anatomical and physiological research is going on.

In building, an excavation was first made for the base, in which a lot of loose stones and gravel were placed, in order to secure adequate drainage below the cement. On top of this the cement base and fire box were made. The base consists of a rectangular box made of cement, open at the top and with a small opening in front through which the fire is fed and which serves as a

draught. The walls are about 6 inches thick. The inside dimensions of fire box being 2 foot 3 inches by 1 foot 9½ inches by 1 foot 4 inches. Across top of fire box there were laid, while the cement was still soft, some old grate bars from a small steam boiler which had been discarded. These were set close together and held firmly in place when the cement hardened. They form the grate on which the material to be incinerated is thrown.

The incinerating chamber was made from galvanized iron by a local tinsmith. This consists of a rectangular box 2 feet 2 inches long, 1 foot 10 inches wide, and 1 foot 6 inches high. In the top is cut a round hole 12 inches in diameter, which is protected by a hinged cover 15 inches by 14½ inches. This galvanized box has no bottom. It is placed on top of the grate bars and held firmly in place by cement worked up around its lower edges. At the back of this iron cremating box is an opening for a stove pipe which is necessary in order to give the proper draught. A wooden box is provided which sets over the galvanized portion to protect it from the weather when not in use.

FIG. 235—CONCRETE CREMATORY
Photo from Maine Experiment Station.

all the lye, add more water slowly. Let this stand for at least 3 hours until the lye is completely dissolved and the solution is cold; then add the cold lye solution very slowly to the linseed oil, stirring constantly. Not less than 5 minutes should be taken for the adding of this solution of lye to the oil. After the lye is added continue the stirring until the mixture is in the condition and has the texture of a smooth homogeneous liquid soap. This ought not to take more than a half hour. Then while the soap is in this liquid state, and before it has a chance to harden, add, with constant stirring, 8½ quarts of commercial cresol. The cresol will blend perfectly with the soap solution and make a clear, dark brown fluid. The resulting solution will mix in any proportion with water and yield a clear solution.

Cresol soap is an extremely powerful disinfectant. For general disinfecting, such as houses, incubators, nests, and other wood work, it should be used in a 3 per cent solution with water. Two or three tablespoonfuls of the cresol soap to each gallon of water will make a satisfactory solution. This solution may be applied through any kind of spray pump or with a brush. Being

* Condensed from Maine Station Bulletin No. 216.

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