

CHICK RAISING IN OKLAHOMA

BY R. B. THOMPSON

A vigorous chick—the kind that grows into a profitable pullet if careful attention is given to details of feeding and management.



OKLAHOMA AGRICULTURAL EXPERIMENT STATION

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By R. B. THOMPSON
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INTRODUCTION

Poultry keeping on the farm today stands as an essential world agricultural industry. To fulfill its mission, farm poultry must be handled in a thoroughly businesslike manner. All unnecessary, ineffective, inefficient and untried practices should be set aside in order to grow the greatest number of productive chickens.

The great majority of chicks are hatched in hatcheries; but there is still quite a number of chicks hatched in home-operated incubators, and some hen hatching is still done on farms. When hen hatching and home-operated incubators produced the bulk of the baby chicks, it was not common to hatch many chicks before May. Now the best returns come to those who hatch or secure their chicks earlier than May. Many farms brood two lots of chicks each year, one lot in December or January and the second in March or April.

The increased importance of poultry keeping as a farm industry, and the increased practice of hatching while the weather is still cold, mean that the proper brooding and feeding of chicks is of great importance. The first four weeks of a chick's life are of vital importance to the future success of the chick, whether a broiler, roaster or layer. A glance at the growth rate of a good baby chick with good brooding and feeding readily fixes the importance of these first weeks. When hatched a chick weighs about $1\frac{1}{4}$ ounces. When two weeks old the chick should weigh more than double that, or about $3\frac{1}{2}$ ounces. At four weeks of age the weight should again about double, to the neighborhood of 8 ounces or $\frac{1}{2}$ pound. When six weeks comes around another double should be made, to approximately one pound in weight. Chicks that do not follow closely this schedule of doubling size are either poor chicks, improperly fed, poorly brooded, or disease infected.

Remember, chicks can be improperly fed with the best of feed as well as with poor feed. They can be improperly brooded with the best of equipment. Good chicks under insanitary or unfavorable conditions may be infected with any disease to which they are exposed.

The ability of a person to attend to details is a measure of success in brooding chicks. Before chicks are on hand the equipment must be ready and the routine of operation must be planned for careful, prompt, and accurate execution.

THE NUMBER OF CHICKS TO BUY OR HATCH

Under no condition or circumstances should more chicks be purchased than there are brooding facilities to handle. If a brooder house large enough for 300 chicks is available, do not attempt to put 400 chicks in it. One of two things will likely happen. There will be enough loss to reduce the number of chicks; or, if loss does not occur, the chicks will not be the strong, sturdy chicks they would be if not crowded. Exceptions do happen to this recommendation, but seldom twice to the same person.

A few years ago six chicks were required to produce one pullet suitable to put into the laying house. Today capable poultrymen have no difficulty in producing one good pullet from three chicks. An all-around advance in quality has brought this about: better poultrymen, better equipment, better feeding, and better chicks. Persons uncertain of their ability or of other quality factors would probably do well to start with four chicks for each pullet wanted. These figures have to do with straight-run chicks. For sex-separated chicks the minimum to buy would be at the rate of one and one-half pullet chick for each mature laying pullet wanted. Allowance must be made for loss and to incorrect sex separation, brooding and growing mortality, and culling before production.

On the six chicks per pullet basis it required 450 chicks to produce 75 good pullets. On the four chick per pullet basis, 300 chicks will be needed; and on the three chick basis 225 chicks will be enough.

HOW MANY HENS PER FARM?

It is not possible to determine by rule how many hens are desirable on each farm. The number of hens for a farm depends upon the house room, range or yard conditions, attitude and interest of the farmer in poultry, ability of the farmer to manage poultry, and his willingness to give poultry the regular fed, care and attention necessary for success.

Whether the farm unit is to be 30 hens, 150 hens or 300 hens must be decided by each farmer. The chicks to produce

a farm flock of 30 hens can be hen hatched at home and hen brooded. One hundred hatchery chicks should maintain hen flocks of this size class. These 30-hen flocks will produce eggs and chickens for the average farm family without surplus for sale at any season of the year.

A unit of 300 hens has great possibilities where chickens are a part of a well organized farm. The desirable equipment to keep and reproduce this unit consists of: (1) an Oklahoma straw-loft open front house 20x70 feet to provide three rooms each 20x20 feet for hens and one room 10x20 feet for feed storage, general supplies and service and (2) two brooder houses not less than 10x12 feet floor size, and best 12x16 feet floor size. All the chicks brooded should not be the same age, but brooding facilities will be necessary for all the chicks at the same time. Three 10x12 feet floor size summer range shelters would be valuable for growing the pullets but not entirely essential. To maintain this unit will require 600 straight-run chicks or 300 sex-separated pullets for the 200 good pullets for flock replacement in a flock of 300 hens.

A unit of 150 hens can be considered. Absolute minimum equipment for satisfactory operation of this unit is one 20x20 straw-loft laying house, one 10x12 portable brooder house and one 10x12 pullet summer range shelter, together with ample feeding and watering equipment. On the basis of three chicks per pullet and annual replacement of two-thirds of the flock, it will be necessary to brood 300 chicks each year. In most cases better success will be experienced with 100 laying hens in a 20x20 house.

THE BROODER HOUSE

PORTABLE HOUSE IS BEST

Farm brooding is best done with the portable colony brooder house.

The chief advantage of the portable brooder house is that it can be used in one location in early season and moved to clean ground for the second brooding of chicks. A move later to clean growing range is also possible, and rotation from year to year to different parts of the farm adds to its value.

For brooder houses 12x16 feet or larger, and others that cannot be moved to clean ground, the use of either wire-floor or concrete-floor porches is possible. Either heavy-gauge 1-inch mesh poultry netting or 1x2-inch welded wire fabric are

the most satisfactory wires for floors. If concrete is used, provisions for rapid runoff of water should be made to facilitate daily washing and cleaning of the floor. A porch with wire floor should be not less than 10 inches from the ground. The side wall of the porch should be not less than 30 inches high, and the entire porch should be detachable from the house and easily movable. The top and sides should have doors for attending to chicks and for cleaning.

The use of a porch is to keep chicks entirely off contaminated ground. One slip that permits the chicks to get on the ground or contamination to get into the house and the value of the porch is lost. Chicks can be grown for six to eight weeks in the brooder house and on the sun porch in confinement. With care, and if they are not overcrowded, pullets can be raised to maturity in confinement. This is not necessary in Oklahoma, is not recommended or encouraged, and should be done only as a last resort on badly contaminated farms.

It must be recognized at this point that chickens raised on porches or in confinement are much more subject to infectious diseases when they are placed on the ground than those raised on the ground. Chickens which will later spend their life on the ground should be raised on the ground to build a resistance to ground-borne troubles.

SIZE AND CAPACITY OF HOUSES

To be portable, a brooder should not be more than 10x12 feet floor size. A house this size on skids or runners can be braced sufficiently and is not too heavy to move with a good team or tractor. A house as large as 12x16 feet floor size can be moved with a tractor but is likely to be twisted and damaged in moving.

The 10x12 foot brooder house will brood about 300 chicks. The 12x16 foot brooder house has floor space for almost 500 chicks but best results will be had when not more than 350 are brooded in it. To determine the floor capacity of a brooder house for March and April multiply the number of square feet in the floor by $2\frac{1}{2}$. For January and February, multiply the number of square feet by 2.

Floor space is not the only factor which determines the chick capacity of a brooder house. Size and efficiency of the brooder stove, light, ventilation, season of the year, experience of the operator and kind of chicks are other factors. When in

doubt as to the number of chicks that should be brooded in any house, always lean towards fewer rather than more and help to prevent crowding. In no case should more than $2\frac{1}{2}$ chicks per square foot of usable floor space be brooded in one house.

TYPES OF HOUSES

Shed-roof.—The shed-roof type house is suggested as satisfactory for a portable brooder house. It is easy and economical to build, convenient to operate, and has a long life. The front or 12-foot side of a 10x12 shed-roof house should be 8 feet high and the back 6 feet high. These heights will permit ease of working in the house, and sufficient size for good ventilation. About one-third of the front should be covered with muslin and glass or glass substitute. Whatever is used, it should be in removable frames or sashes. This makes it possible to store the frames and preserves the material during the summer after it is no longer needed in the house. The frames should be so attached that they may be easily opened for ventilation and direct sunlight.

Plans and pictures of a 10x12 ft. portable shed-roof brooder house are given on pages 8 to 12. The materials required for its construction are shown in the following list:

BILL OF MATERIAL

10x12 ft. Portable Brooder House

(Boxing and Batten Construction)

	Runners		Back
2—2x4-14		4—2x4-12	
2—4x4-14		6—1x12-14	
	Floor Joists	6—1x4-14	
7—2x4-10			Perches
	Floor	3—2x4-12	
40—1x4-12	flooring		Windows
	Roof	6 frames to fit front openings	
7—2x4-12			Hardware
21—1x8-14	shiplap	1 barn door latch	
$1\frac{1}{2}$ squares	composition roofing, OR	1 pr. 6" strap hinges	
13 pcs.	6-foot V-crimped galv. iron roofing, not less than 29 gauge	2 pr. 4" strap hinges	
		5 lbs. 16d nails	
	Front	15 lbs. 8d nails	
2—2x6-16		9 ft. 48" wide one-inch mesh	
4—2x4-12		poultry netting	
5—1x12-18			Paint
5—1x4-18		1 gal. ready mixed house paint	
	Ends		
4—2x4-10			
10—1x12-16			
10—1x4-16			

A. and M. Straw-loft.—The Oklahoma Agricultural Experiment Station has recently developed a straw-loft brooder house. This house, in two floor sizes (10x12 feet and 12x16 feet), is in regular use on the college poultry farm and is open for inspection by visitors. This house, like the shed-roof type, is easy to build and relatively inexpensive. The straw loft makes it possible to use galvanized iron roofing without the necessity of solid or insulated sheeting. The house is designed as an even span house with a 6½ foot ceiling. The long axis of the house is north and south, with the entrance door on the south. On both the east and west sides, there is a glass window and chick entrance door near the back of the house. There are doors in the back for additional ventilation and circulation of air.

Plans for a stationary straw-loft brooder house 12x16 ft. in size are given on pages 20 and 21. Pictures which will be helpful during construction are shown on pages 13 to 15. The bill of materials needed is as follows:

BILL OF MATERIAL

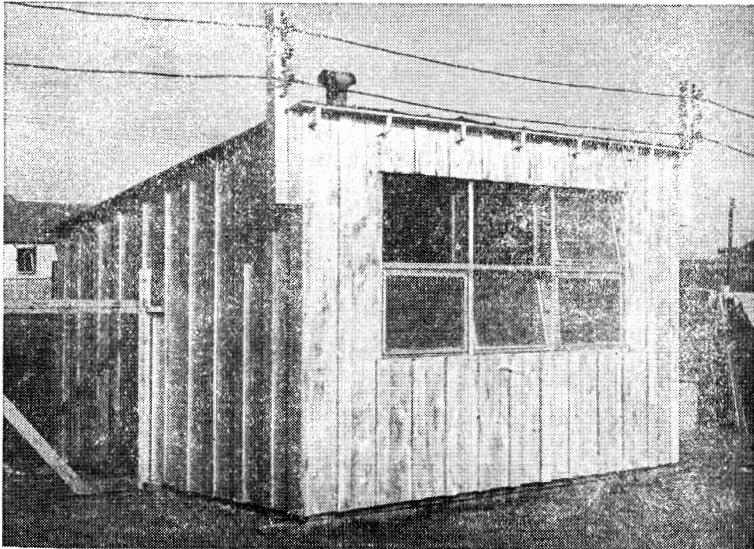
Oklahoma 12x16 ft. Straw-loft Brooder House

	Rafters		Sheeting
9—2x4-14		8—1x6-16	
	Plates and Sills		Door Braces
4—2x4-16		3—1x6-12	
4—2x4-12			Roof
	Nail Girts and Rafter Braces	9 bundles shingles, OR	
5—2x4-12		16 pcs. 7 ft. corrugated galv. iron	
3—2x4-16		Door Stops and Opening Frames	
	Studs	10—1x2-16	
7—2x4-14			Windows
	Straw-loft Ceiling Slats	2—4-light, 9x12 glass single sash	
41—1x4-12			Miscellaneous
	Battens	5 pr. heavy 6" strap hinges	
15—1x4-14		5 door latches	
11—1x4-16		2½ yds. concrete for floor and footing	
	Boxing	16 pcs. ¼" or ½" hardware cloth 6"x23"	
12—1x12-16		3 pcs. 24"x1" poultry netting, 12 ft. long	
16—1x12-14		1 pc. 36"x1" poultry netting, 10 ft. long	
	Front and Back Ventilation Slats	1 pc. 36" glass substitute or muslin, 6 ft. long	
5—1x4-16		6 ⅜"x6" anchor bolts	
	Ceiling Joists		
2—2x4-16			
	Rafter Bracing		
	(to suspend center of ceiling)		
4—1x6-12			

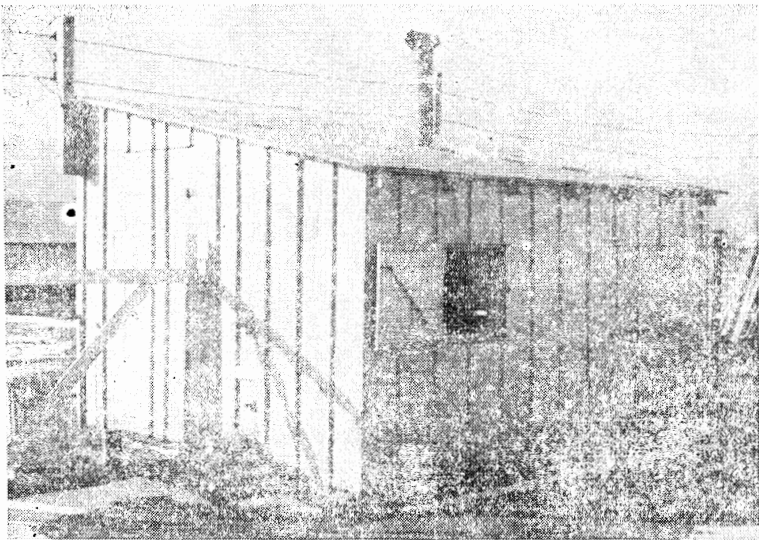
CONSTRUCTION REQUIREMENTS

Ventilation.—In any brooder house, there should be hinged doors or windows in the back of the house. These are necessary for air movement through the house during the summer. They may be either single-glass barn sash or solid doors made of 1x12 boards. All openings should be covered with one-inch mesh poultry netting to keep the chickens in and cats, skunks, and other varmints out.

Roof.—The roof must be good. For shed-roof houses without straw loft, felt or paper roofing is permissible but is good for not more than three or four years. The V-crimped metal roofing costs about the same as two paper roofs but is longer lived and is hail and damage proof. It is used on solid wood sheeting, as is the paper roofing. Without solid sheeting under it the galvanized iron roof permits condensation of moisture and also causes greater extremes of temperature, both of which are detrimental to baby chicks or any chickens. On straw-loft houses, the V-crimped or corrugated iron roofing is used without solid sheeting, and reduces the cost.



South and west side of a 10x12 ft. shed-roof portable brooder house. Note covered frames in open front for use in extreme weather at the beginning of the brooding period and to protect chicks from wind at any time.

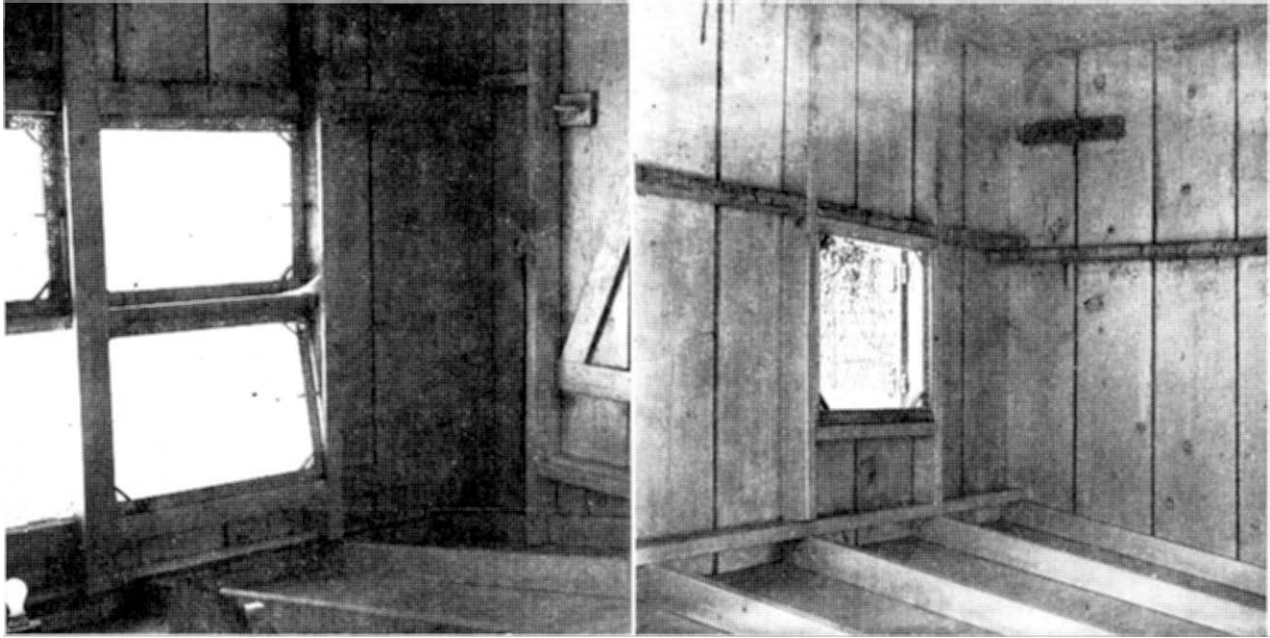


East and north sides of a 10x12 ft. portable shed-roof brooder house. Note door in side for summer ventilation, chick exit door on east side with steps of brick for chicks to use, portable fence between chick door and service door to brooder house, feed can convenient to service door, and galvanized iron roof on shiplap sheeting.

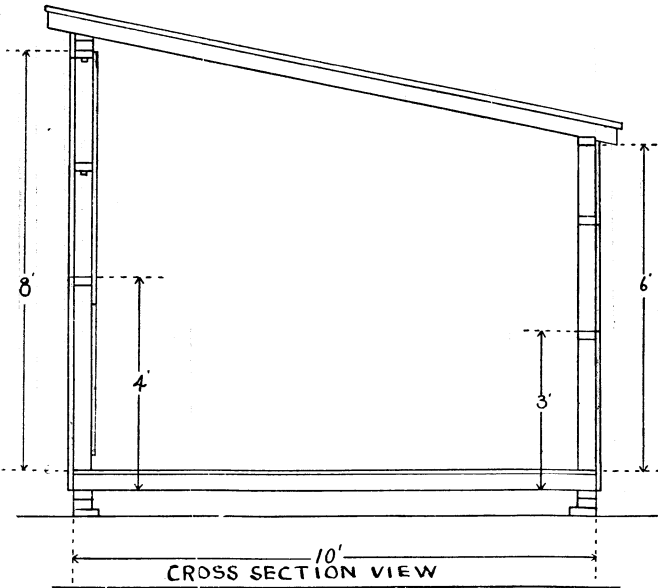
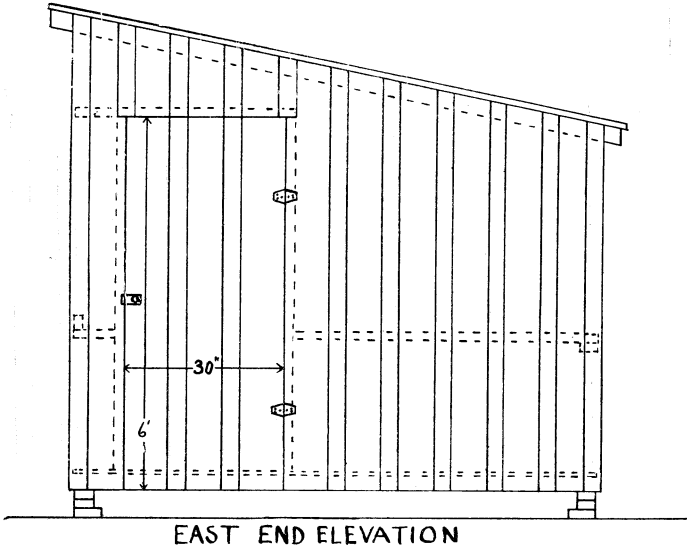
METHODS OF CONSTRUCTION

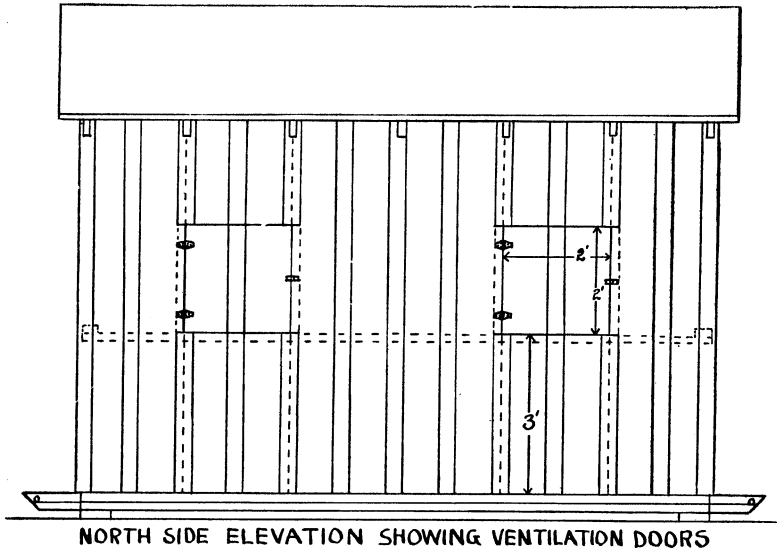
In building a portable colony brooder house on the farm, two men should plan to use about two or three days for construction work. Building of the house should be started not less than three weeks before the date chicks are to occupy it. This will act as insurance against bad weather, allow paint to dry, and give time to properly regulate the brooder stove and attend to other unexpected details.

Acceptable portable brooder houses have been built with both boxing and batten, and studding and siding construction. The boxing and batten is probably the tightest wall and cheapest to build; but more careful workmanship is required to keep it square and plumb because it does not have the studding frame to build to. For battens, regular 1x4, No. 2 grade sheeting is used. One piece of 1x12 boxing is used for each 12-inch space on the wall. This leaves wide cracks between the boards which are easily and tightly covered by the 1x4 battens. These cracks make sanitation and cleaning easier. No studs are used in the corners and the studs between front windows and at

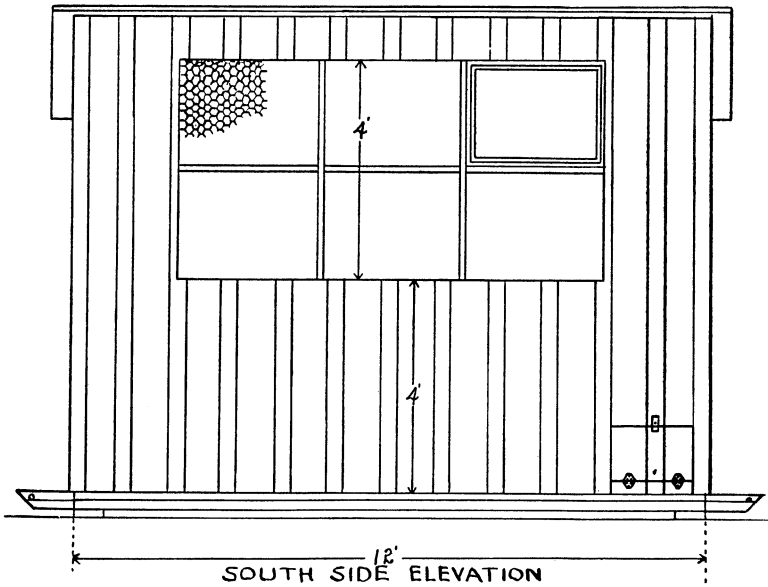


Northeast (left) and southeast (right) inside corners of 10x12 ft. shed-roof portable brooder house. The picture on the left shows back and side framing and construction, while that on the right shows framing and construction for front and corner.

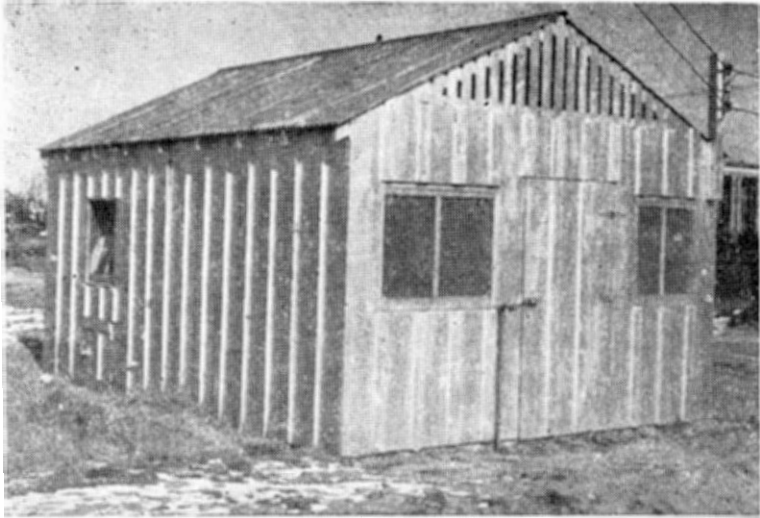




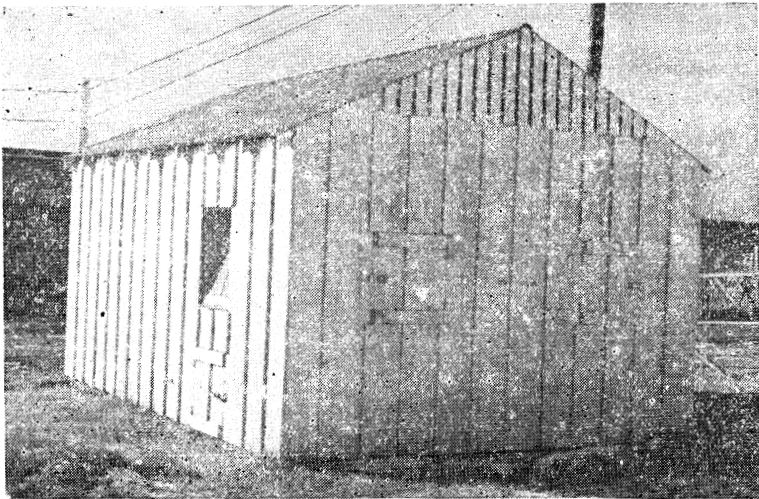
NORTH SIDE ELEVATION SHOWING VENTILATION DOORS



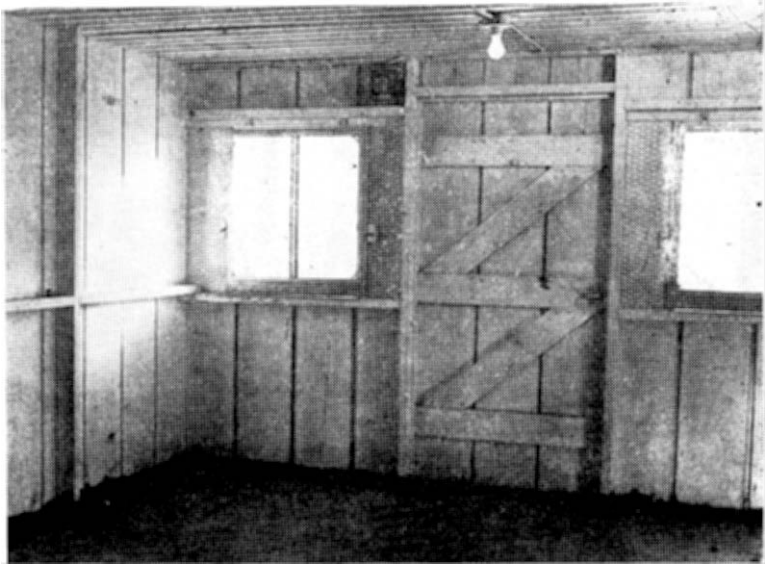
SOUTH SIDE ELEVATION



South and west sides of 12x16 ft. stationary straw-loft brooder house. Note chick exit door and window for light on the west side near rear of house, slatted ventilation above straw, and galvanized iron roof on 1x6 sheeting set on approximately 24-inch centers.



North end and east side of 12x16 ft. stationary straw-loft brooder house. Note doors in north side for summer ventilation, and window and chick exit door on east side near rear of the house.



Interior view of 12x16 ft. stationary straw-loft brooder house showing south and east sides with framing and construction and straw-loft ceiling.

each side of doors are accurately spaced so as to eliminate door and window frames. No. 2 yellow pine is quite satisfactory for building brooder houses.

The runners are 4x4 with a 2x4 shoe or half sole on the bottom of each runner. The 2x4 shoe can be replaced without damage to the runners proper and the life of the house thereby increased.

The use of hardware cloth floors in the brooder house is advisable where the most rigid sanitation is desired. The brooder house is built as usual and frames made to fit the floor of the brooder house. The hardware cloth is nailed to these frames. One-half inch mesh hardware cloth is a good size to use. The frames should be in several sections for each room, to make removal for cleaning easy. The frames should be



Interior view of 12x16 ft. stationary straw-loft brooder house showing door in north side opened, window and chick exit door on west side, framing and construction, and ceiling for straw loft.

made to cover the entire floor without leaving cracks or openings for the chicks to come in contact with the bare floor and droppings. One-inch material is not best to use for these frames because it will not support weight on the hardware cloth without allowing it to sag and touch the floor, and touching the floor destroys the sanitary value. Two-by-four inch dimension lumber should be used. To reduce the two-inch exposed top of the frame, the top inside edge of the frame should be beveled to leave about five-eighths of an inch nailing surface on the top outside edge. Place the brooder stove, feed hoppers and water fountains on top of the hardware cloth covered frames. The attendant must take care and walk only on the wood framework and not step on the wire.

It must be remembered that where wire floors are used in brooder houses because of insanitary or infested yards there will still be a day of reckoning. This type of brooding cannot go on indefinitely on one farm where the resulting pullets must live on the ground. Chickens which as adults must live on the ground should be raised on the ground and it is not consistent to do this with wire-floor brooder houses.

THE BROODER STOVE

The safety of the chicks depends upon the reliability of the source of heat, and its control and regulation. Simplicity and effectiveness of the automatic heat regulator, adequate heat, and sturdy construction with good materials are points to be certain about in selecting any kind of a brooder stove.

There are good brooder stoves which use wood, coal, gas, oil (either kerosene or distillate) and electricity for fuel. Whatever the fuel used, there are hazards to guard against. All brooder stoves require regular and systematic attention to successfully brood chicks.

WOOD-BURNING BROODERS

The newest thing in brooder stoves is a satisfactory wood-burning stove. Almost any kind of wood can be used for fuel. Black jack is considered especially good. These wood stoves must be of air-tight construction with tight-closing and accurate dampers. The fuel door should be large to take big wood. The flue must be straight up and properly insulated with adequate safety devices to prevent "creosoting," which is a fire hazard when permitted. There should be enough cast iron parts in the right places to make the stove rigid and long-lived.

Where brick stoves, dutch ovens, oil drum stoves and similar home-made devices have been used because wood is readily available for fuel, it is urged that these factory-made and automatically regulated wood-burning stoves be investigated.

COAL-STOVE BROODERS

The coal-stove brooder has been popular for many years and has developed in recent years so that it is not now necessary to have hard coal to be successful with it. All coal brooders will not burn soft coal, so do not attempt to use soft coal in a stove designed for hard coal.

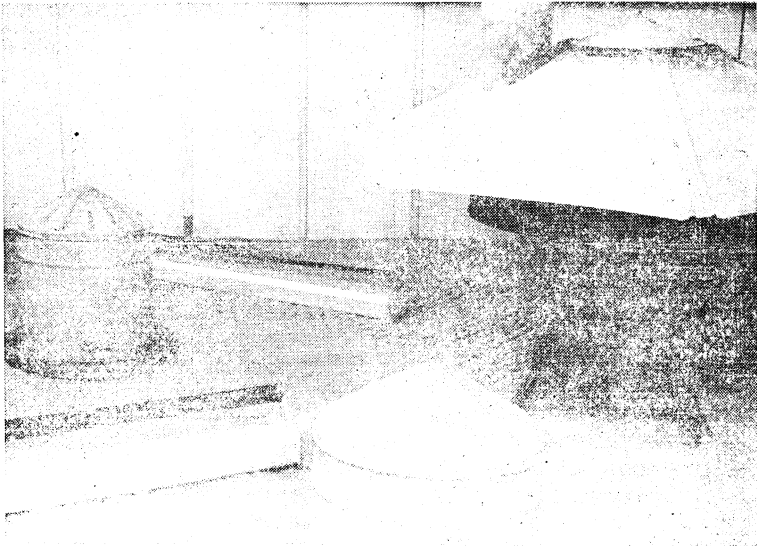
An ideal coal stove should have a large fire pot. The flue should be not less than five-inch stove pipe. Even with the increased size of fire box and pipe, the capacity of these stoves should not be overtaxed. A convenient fuel door, good shaker grate, and adequate clean-out door are essential to a good coal stove. The stove should be heavy cast iron and the thermostat controlled dampers accurately fitted and simple in design.

A 52-inch canopy will accommodate not more than 300 chicks with best results. Care should be taken with the coal to tend the fire early enough in the evening so that it will be in good condition for the night at bed-time. Use sand on the floor under the hover of a coal stove.

OIL-BURNING BROODERS

Several types of oil-burning brooders are on the market, the chief difference in them being in the types of the burners. One type, which burns only kerosene, is the wick burner which is regulated by turning the wick up or down. This is done by the operator, and not by an automatic regulating device. The wick-type burner maintains a constant flame, and the hover temperature is regulated by a ventilating flue and damper operated by a thermostat. Another type of burner which uses either kerosene or distillate, has an asbestos or metal ring which acts as a vaporizer. The temperature in this type is regulated by a thermostat, which controls the flow of oil to the burner.

In both types, the burner is located under the center of the hover with the oil reservoir outside the hover. All kero-



The wheel spoke arrangement of chick feeders is used on all types of brooders. This canopy type oil-burning brooder is used with sand on the floor.

sene brooders must be set level by the use of an accurate carpenter's level. Kerosene brooders require careful operation and the directions of the manufacturer should be studied well and then followed. It is a safety measure to use only sand under the hover of oil brooders. Curtains should be used with great care. Some wick type burners use curtains on the hover. A curtain is seldom used on the ring-type burner brooders. It should be remembered that the oil burner requires ventilation and fresh air as well as the chicks, and without it trouble is sure to come. Do not attempt to operate oil brooders where there is a draft, and use only good grade kerosene or distillate as recommended by the manufacturer.

The drum type oil burning brooder stoves have been on the market for several years. Only recently have burners been improved to cut down fuel cost. Even now this type burner uses considerably more fuel than the wick-type burners. Wick type burners are not desirable because they seldom provide sufficient heat under the hover in early season brooding and are not readily regulated. Drum type oil burning stoves should have a good cast iron fire pot and spreader. The oil feed lines should be direct and easy to clean with strainer and sediment trap. The oil feed should be through a visible drip fitted with good cast valves and regulator arms. An over-flow fuel pipe is essential; and the burner must have efficient thermostat control.

Because drum type oil stoves and their small canopy or heat deflector are inclined to heat all of the room in which they are located they are especially well adapted to two-room brooding. With the brooder stove in one room and the other room cool, the chicks can feed and exercise in the cool room then return to the warm room when they feel the need of heat.

ELECTRIC HOVERS

A modern development in brooding equipment is the electric hover. In all electric hovers, the matter of ventilation is one which requires strict and close attention. It is essential to have ventilation under the hover to eliminate moisture as well as to provide fresh air for the chicks. Manufacturers' directions for current connections and operation should be studied carefully. Chick capacity must not be overtaxed. The rating of capacity in electric brooders as in other brooders is often overstated. To be safe, each chick under an electric hover must have a minimum of eight square inches of floor space for late March and April brooding. The space should be

increased or number of chicks brooded lessened so that there will be 12 square inches per chick for December, January and February brooding.

It has been definitely determined that the brooder itself should be the only source of heat in the brooder house, so extra heat outside the hover is not needed when an electric hover is used. In the absence of floor drafts, chicks may be successfully raised when the house outside the brooder itself is cold enough to freeze water.

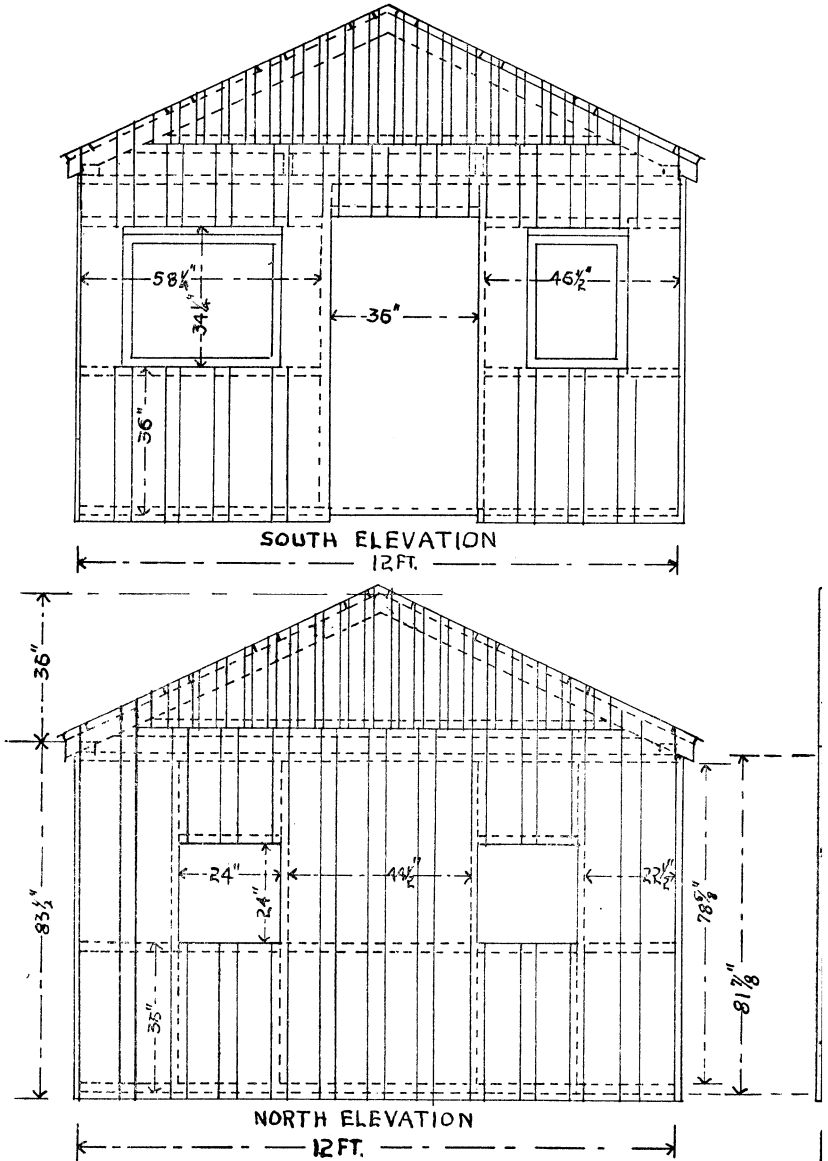
Electric brooders must be well insulated and placed on a solid, tight floor. The kilowatts used during the brooding period will vary from one to two and one-half per chick in early season to one-third to two-thirds per chick in late season brooding.

Tests at this experiment station thus far indicate that a fan is not necessary in an electric brooder. However, ventilation to remove stale air and prevent moisture condensation is essential. During damp weather or with inadequate ventilation it may be necessary to clean wet litter at edge of hover several times a week.

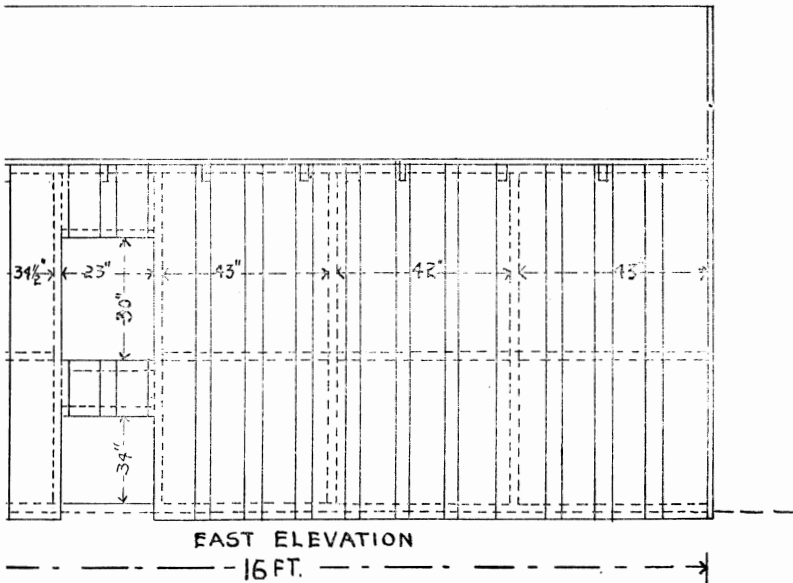
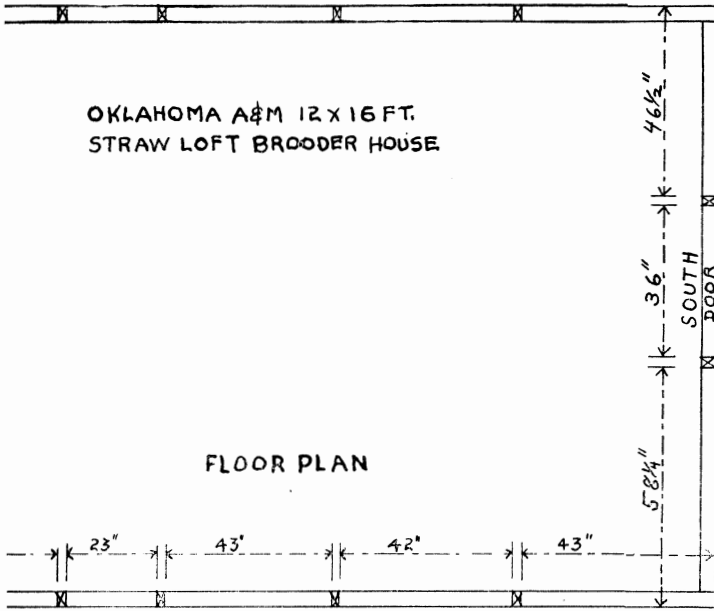
It must be remembered that under an electric hover the temperature is uniform and the same under all parts of the hover. Other type hovers have a comfortable zone, a zone where it is too hot, and a zone where it is too cold. Under these conditions chicks can move back or forth and pick a temperature to satisfy them. Under an electric hover this is not possible. The temperature is the same under all sections and must be satisfactory to the chicks for the best brooding results.

GAS-BURNING BROODERS

There are several kinds of gas-burning brooders, including canopys with open burners either on stands and suspended and with and without thermostat control. Drum-type stoves similar to the kerosene drum-type are fitted with gas burners and are also found with and without thermostat control. The types without a flue, controlled by thermostat and pilot flame, are most satisfactory where ventilation is carefully watched. The type canopy suspended from the ceiling by a cable can be fitted with a counter weight and lowered and raised to suit circumstances. It can be used to direct chicks to perches but has the disadvantage of being connected with a rubber or flexible metal tube. This is always considered a hazard. It is not recommended to raise the brooder as chicks grow older for this wastes heat under the hover and increases the heat



Plans for an Oklahoma A. and M. 12x16 ft. stationary straw-loft brooder house. Bill



ials is given on page 7, and pictures of the house are shown on pages 13 to 15.

in the room. The canopy connected with rigid pipe has the safety advantage but can occupy only the one location in the brooder room, which in the end is not a serious inconvenience.

HOT WATER BROODERS

Hot water systems are generally used only in large brooder houses with capacity of 2,000 chicks or more separated into sections of about 200 chicks to the section. A successful hot water brooder must have a large capacity boiler to furnish the hot water to the pipes which heat the hovers. Hot water brooders are not heated with steam, but with water at a temperature seldom over 190 degrees F. There have been some successful home-made systems of small chick capacity. These have been heated with oil-, gas-, and coal-burning boilers.

Both bottom and top heat have been used with success. Bottomheat hot water brooders have the hot water pipes under the house floor of the hover. The pipes are generally buried in the concrete floor and are not more than four inches under the surface at the boiler end. A normal grade of about one-half inch to 10 feet of hover will cause the water to circulate, especially if the return pipe has a slightly greater fall. Two 1¼ inch pipes will heat a hover 24 inches wide. The length of house will depend on the boiler or heater. An ordinary double-coil gas water heater will heat as much as a 60-foot hot water brooder either top or bottom heat.

Top-heat hot water brooders have the pipes over the chicks, rather than under the floor. At the end of the system the pipes should not be less than six inches above the floor. The fall and size of pipe for top heat are the same as for bottom heat. In any hot water brooding system an open expansion tank and reservoir is necessary. The expansion tank can be located at either end of the system.

A hot water heated hover 2 feet deep and 6 feet long with a room 6 feet wide and 14 feet deep will accommodate 200 chicks. Two sections this size are ideal for a 350-chick unit. A simple hot water hover is made by the use of a 1x12 board for a back and two 1x12 boards for the top and a 1x12 board for each end. One of the top boards should be stationary and the other hinged to it. Ventilation is controlled by raising the hinged top board. An outing flannel curtain is good for the front. It should come to not less than one inch from the floor. Hover temperature is controlled by the water tempera-

ture and by the hinged top board. It is recommended that persons not familiar with the general principles of hot water heating and the action of hot water boilers do not attempt to build a hot water brooding system.

BATTERY BROODERS

As early as 1913, battery brooders were on the market, but leg weakness developed among chicks raised in such brooders could not be overcome and the brooder was condemned. Since then the discovery of vitamins has controlled leg weakness, or rickets as it is properly known. Vitamin D supplied by fish liver oil, violet ray electric lamps or synthetic vitamin D is the factor which controls rickets.

The battery brooders are so called because they are usually built in batteries of about six brooders, one above the other. There are also single section or drawer-type brooders that might be desirable on farms equipped for them.

One battery brooder section 30"x36" will care for 100 chicks until they are three weeks old. This is made possible by strict sanitation through the use of hardware-cloth floors and outside feed and water troughs so there is no possible chance for the chicks to spread contamination of any sort. Battery brooders are made in electric, gas and hot water heated styles. There are also types that depend upon room heat alone, but these are not advisable for starting chicks.

Electric battery brooders are heated by regular ring, coil or bar heating elements, or by carbon or Mazda lamps. Heat is transmitted to the chicks either by direct radiation from the heating elements or through contact and diffusion in what is called "back warmer" types. This "back warmer" type has gained rapid popularity. The best types of electric battery brooders have thermostat controlled heat units and dropping pans that can be removed easily and without disturbing the chicks. Hot water battery brooders are made in large groups of units and heated from one coal, gas or kerosene water heater. The battery brooders with heating units can be operated in almost any room, but the sort without heat must be operated in a carefully heated and ventilated room. Some makes of these brooders are of a size, and so arranged that, by a process of thinning out and moving, the chicks can be raised to broiler size in the battery brooder.

The battery brooder section that holds 100 chicks for the first three weeks will hold not more than 45 chicks from 3 to 6 weeks old and not more than 20 chicks from 6 to 9 weeks old.

It is not recommended that pullets be carried in battery brooders beyond the age of four or five weeks, and even then there is greater danger from Cecal Coccidiosis when these chicks are placed on the ground than there is with chicks brooded on the ground.

For brooding farm flocks the battery brooder has limitations. This type brooder is quite costly and chicks brooded to produce layers will need brooder heat after they have outgrown the starting battery. The need of floor brooding space and equipment is evident even when chicks are started in battery brooders.

GETTING READY FOR THE CHICKS

CLEANING THE BROODER

Clean the brooder house each time it is used for a new lot of chicks. Remove all equipment from the house and clean it outside the house. Sweep or brush and scrape the ceiling and walls to remove all loose and stuck dust and dirt. Thoroughly scrub the lower part of the walls and the floor. Use warm or hot lye water, one pound of concentrated lye to 40 gallons of water. When dry, spray the interior of the house with a recognized U. S. disinfectant. Clean and wash with disinfectant all equipment such as water fountains, milk dishes, stove and hover, and mash feeders. Do all this cleaning before the brooder house is moved to clean ground.

Clean ground means just that. It should have had no chickens, hens or turkeys on it, or chicken manure spread on it, for at least one full year of 12 months. Each additional year is added safety insurance. Avoid locating the house where there will be drainage from the laying house or yards. Keep chicks far enough from the old chickens to prevent flies getting from the house of the old chickens to the young chickens. Brood each hatch and age of chicks separately. At the close of the brooding season, clean the brooding equipment and store away from the growing chicks.

STARTING THE BROODER

It is important to set the brooder, whatever kind it is, on a solid, substantial and rigid floor.

Regardless of what kind of brooder is to be used, it should be in operation at least two days before the chicks are to be

placed in it. It should be remembered definitely that the brooder is the chicks' mother, except during the time the person tending it is present.

If the brooder house is an old one, the entire interior as well as feeders and other equipment should be scrubbed with hot lye water. The interior should be painted at the beginning of each brooding season with a white casein paint or aluminum paint or thin whitewash. Do this after scrubbing and before the brooder stove is set up.

Put sand on the floor under the hover soon after the fire is started, so the sand will be thoroughly dry when the chicks are put on it. Any sand that is suitable for making concrete is suitable for chicks. It must be clean and rather coarse. Do not use blow or drift sand. Do not fear chicks eating sand if they have ample feed and water.

Cover the floor outside the rim or edge of the brooder with about an inch of chopped alfalfa hay, cut straw, ground corn cobs, sugar cane pulp, or peat moss litter. Whatever is used it must be clean, free from mold or dust, and dry. A tight floor covered with a thin layer of sand and straw is better than a poor floor covered with a thick layer. Clean the floor when litter becomes dusty or dirty. Never leave litter on the floor after it has been wet.

The best poultrymen use thermometers in a brooder house only to regulate the stove before the chicks are put in the house. The action of the chicks are the best guide for experienced operators.

Temperatures of the brooder should be 90 to 95 degrees with the bulb of the thermometer at the edge of the hover and about one inch above the floor. This temperature should be maintained for the first week. This means that further under the hover the temperature is likely to be as high as 100 to 105 degrees, which is perfectly all right. At the beginning of the brooding period, hardy chicks must have two temperature areas, one under the hover which is 100 degrees or higher where they can get warm, and another outside the hover on the floor where the feed and water are located which can be 70 degrees or lower.

The best indication of temperature conditions is the way the chicks act. If the chicks crowd the stove, the temperature is low or there is floor draft that chills them. If they hold away from the stove outside the edge of the hover, the temper-

ature is too high. The temperature should be such that the chicks will be under the outer edge of the hover and not packed into a tight circle. Crowding into corners of the room away from the stove may be caused by either over or under heating. In either case, trouble will follow such crowding as it is the beginning of a habit that is most difficult to control or break.

To train the chicks where the stove is and where the limit of the brooder heat is, a guard ring made of hardware cloth or one-inch mesh poultry netting, doubled, should be ready before the chicks are taken to the brooder. There are many forms of flexible material that can be used for this guard ring. It should be about 12 inches high, and long enough to make a circle around the brooder touching or nearly touching the walls of the room. When the chicks are first put in the brooder, this circle should be only a trifle larger than the hover. The wire may be covered with burlap or muslin to shut off drafts where they exist. Floor drafts can be detected by vacant sections in the circle of chicks under the hover, for in such cases the chicks will all crowd to one side of the hover. To cut off violent drafts, it is well to hinge together two or more pieces of 12-inch boards about 30 inches long. These can be placed so as to protect the chicks from floor drafts or air currents that cannot be controlled or eliminated otherwise.

START WITH GOOD CHICKS

SELECTING HATCHING EGGS

A majority of the baby chicks brooded each year in Oklahoma are hatched in chick hatcheries. If, however, the farm flock hatched for him at a hatchery, he should take the same flock owner hatches his own eggs, or has eggs from his own rigid precautions to produce good baby chicks that the best chick hatchery operators follow.

The requirements of flock management, egg selection and incubator operation are as important for the farm operator as for the hatcherymen with a mammoth incubator.

There is a certain and positive demand on the commercial market for eggs that weigh two ounces each and for healthy, vigorous, well developed poultry. The eggs and poultry produced on farms can be gradually improved toward these standards by selection of hatching eggs that weigh 26 ounces per dozen and are produced by only the most vigorous and productive hens. The selection is essential, regardless of where or how chicks are hatched.

BUYING BABY CHICKS

When the flock owner buys baby chicks, he must select carefully the hatchery from which he buys. Hatcheries selling baby chicks to farmers secure eggs and hatch chicks under a wide variety of conditions; and, they therefore produce chicks of poor, fair, good or excellent quality and value. The value of baby chicks is determined by the value of the parent stock and the manner in which they are hatched.

Modern incubators are made to do a perfect job of hatching, providing they are properly operated and perfect eggs from desirable breeding stock are used. It is still not possible to hatch good and valuable chicks from poor eggs and poor breeding stock. The dilemma of the baby chick buyer is to know where to buy and how to tell good chicks from poor chicks. Chicks from poor breeding stock often live as well as those that will make good and profitable pullets.

As a rule, good chicks come from hatcheries that are clean, orderly and attractive. The slovenly hatchery has little possibility of putting out valuable baby chicks. It is a sound recommendation to beware of chicks from dirty, ill smelling and disorderly hatcheries. Pick the clean, well organized hatchery every time.

Some clean and orderly hatcheries may be operated by persons who are careless in their business methods. They may also secure eggs from flocks that have neither been carefully selected nor tested for Pullorum disease. Because hatcheries depend on farm flocks to furnish eggs for their incubators, the quality of these farm flocks determines the value of chicks the hatchery can produce. The reliability of the hatcheryman, and his ability as a poultryman to direct the selection of the breeders and management of the flocks, are as important as the appearance of the hatchery and kind of incubators used.

A National Poultry Improvement Plan has been developed with a view toward establishing the poultry breeding industry upon as sound a basis as possible. The adoption of the plan in all parts of the United States should ultimately accomplish two things: (1) make poultry production more efficient, thereby making poultry raising more profitable; and, (2) bring about an improvement in the quality of hatching eggs, baby chicks, breeding stock, and market products.

The primary purpose of the plan is to identify, authoritatively, poultry breeding stock, hatching eggs, and chicks with

respect to quality. This is done by describing them in terms uniformly accepted in all parts of the country. Protection from unscrupulous competition is thereby afforded producers, and purchasers are enabled to buy with confidence.

Health is the foundation of successful poultry husbandry, since upon health depends successful production and reproduction. Constitutional vigor and sanitation provide the best insurance against ill health. Every poultryman and every hatcheryman, therefore, is under obligation to maintain his laying and breeding stock in the best possible state of health by keeping his premises in the best possible state of sanitation.

Since the spread of the majority of the more important poultry diseases results from conditions of filth, it becomes evident that several disease conditions are amenable to sanitary measures.

The National Poultry Improvement Plan provides for grades of flocks, eggs and baby chicks. These grades are U. S. Approved, U. S. Verified, U. S. Certified, U. S. Record of Performance, and U. S. Register of Merit. In each of these grades there may be the additional requirement of Pullorum Tested, Pullorum Passed and Pullorum Clean flocks, eggs, chicks and hatcheries. Hatcheries entitled to use these terms to describe their business have voluntarily and at their own expense placed themselves under the rigid supervision and inspection of official state agencies as recognized by the United States Department of Agriculture. The grade terms "A," "AA," and "AAA" are not in the National Poultry Improvement Plan and therefore do not describe U. S. Approved, Certified or Verified chicks.

Many hatcheries that do not operate under the National Poultry Improvement Plan follow an improvement plan of their own. Some of these independent plans are effective and beneficial, depending upon the sincerity and ability of the persons involved.

The customer who buys baby chicks is frequently responsible for severe loss and unprofitable growth and production of good baby chicks. It is not difficult to destroy the value of and to make poor pullets out of good chicks. The exact opposite is also true. It is impossible to make good pullets out of poor chicks.

CARE OF CHICKS

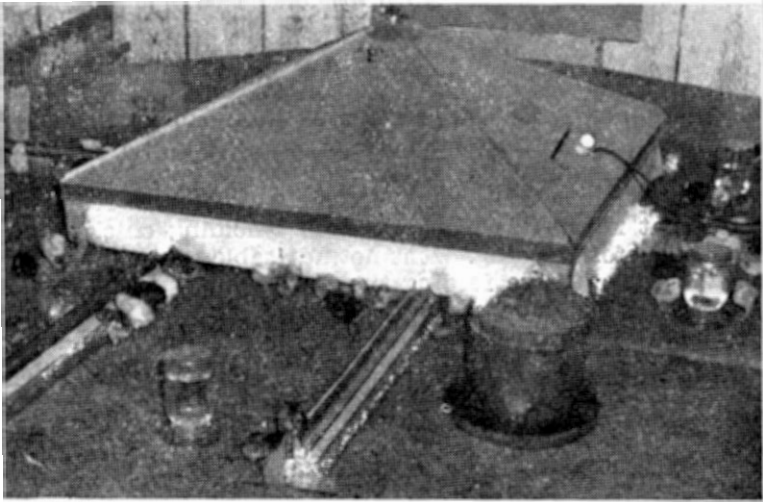
STARTING THE CHICKS

Whether the chicks are started in the brooder house under a hover or in a battery brooder, they are ready to feed when they are thoroughly dried off and active, which is when they are about 24 to 30 hours old. Recent experimental results indicate that nothing is to be gained by holding chicks longer than this before feeding. It is not advisable to put the chicks in the brooder before feeding time. If home-hatched chicks, keep them in the incubator or a darkend but warm and ventilated box until time for the first feeding. After the chick gets out of the shell, an undisturbed rest of 24 to 30 hours is desirable. To hold them longer than this is liable to create an appetite for toe picking or cannibalism. Nature has provided for a rest period by bringing the chick into the world with a supply of egg yolk for food during the early part of its life. Chicks should not be handled or unduly exposed after hatching until fully fluffed and dry.

In the morning of the day following that in which the chicks were put under the brooder, they must have early attention with clean drink and feed. "Early" means when the first chicks begin to stir and before they get restless. Two or three hours after daylight is not early. The chicks will be just as hungry and will require early attention every morning thereafter. "Attention" means filled feeders and water fountains when these first chicks are ready to eat and drink.

Chicks started in battery brooders should have not less than 10 square inches of floor space for each chick. It is advisable to transfer chicks out of battery brooder to the brooder house when they are three to four weeks old. It is possible to carry them in battery brooders only when feed is fortified with vitamins A and D. To produce the best farm flocks, it is recommended that chicks be started and brooded on the floor. In any method of brooding, chicks should have access to a clean yard as soon as possible, even as early as the second or third day they are in the brooder.

In brooding chicks on the floor, prepare the brooder as recommended under the heading "Starting the Brooder." Arrange feeders around the brooder like the spokes of a wheel and place water fountains near the outermost end of the feeders. Chicks must have six feet of mash hopper or feeder space for each 100 chicks. Frequent cleaning of the brooder floor is not necessary as long as the litter is dry and there is no indication of any chick trouble.



Arrangement of chick feeders in wheel spoke fashion around an electric brooder. Water founts are located near brooder and for first two weeks are set directly on the floor. This arrangement is recommended for all types of brooders. Note that feeders on each side are partially under the brooder.

If coccidiosis or other trouble should appear, prompt and vigorous action must be taken. One kind of coccidiosis is identified by bloody droppings; and immediately at any time when bloody droppings from chicks are noticed, the entire brooding equipment must be cleaned and disinfected at once, and repeated daily until the outbreak is under control. Put the chicks immediately on a mash of 20 pounds dried milk, 40 pounds yellow cornmeal, 10 pounds bran, 10 pounds shorts and 20 pounds kafir or barley meal. Feed them nothing else for 6 to 14 days. Give them only clean, pure water to drink.

FEEDING THE CHICKS

The Oklahoma A. and M. College Way of Feeding Chicks.—A method of starting baby chicks that has been used with success in brooder houses for a number of years is known as the Oklahoma A. and M. College Way of Feeding Chicks:

I CHICKS are ready to feed as soon as they are dry and strong enough to walk steadily, which is when they are about 24 to 30 hours old. Chicks should be removed from the incubator during the 22nd day after the eggs were set. If suitable chick boxes are available, the dry chicks may be

placed in the boxes even before this time. Removing dry chicks avoids crowding where hatches are light. Chicks that do not have feed before they are 36 to 42 hours old are so hungry that they eat more than they can digest if the feed is placed before them in unlimited quantities. For chicks that get their first feed when they are more than 36 to 42 hours old, it is necessary to give it to them in small amounts at two- to three-hour intervals during the day for the first four or five days of feeding. By feeding the chicks when they are 24 to 30 hours old they are *not* starved and so hungry that they eat more feed than they can digest. The 24 to 30 hour first feed is most satisfactory when the chicks are allowed to have all the feed they want all of the time from the first feeding on. Never feed moistened or wet mash to baby chicks.

2 A FEED for baby chicks used with good results and known as A. & M. Chick Mash Number CA100 is:

25 lbs. bran	6 lbs. poultry meat and
25 lbs. shorts	bone scraps
25 lbs. yellow cornmeal	5 lbs. dried buttermilk
8 lbs. alfalfa leaf meal	5 lbs. cottonseed meal
	1 lb. salt

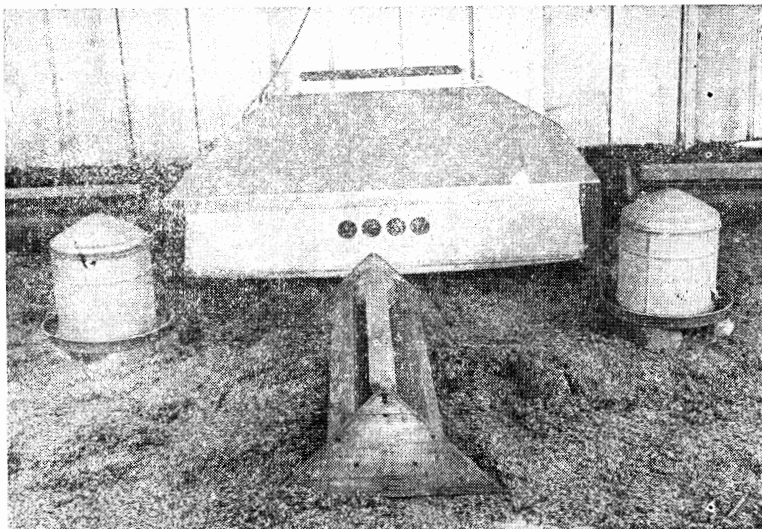
For chicks in battery brooders or confined to the brooder house, fish liver oil or other source of vitamin D according to manufacturers' directions.

3 THIS mash is put into trough feeders made of either wood or galvanized iron. The top of the feeders should be open except for wire guards or a reel to prevent the chicks from getting into the feed. Do not use feeders that require the chicks to eat through small holes unless there are enough feeders to allow one hole for not more than $1\frac{1}{2}$ chicks, which is equal to 200 holes for 300 chicks. Of the open-top feeders there must be one feeder 3 feet long for each 100 chicks. This is good for three weeks, at which time grain is added to the ration and there must be two feeders three feet long for 100 chicks, one for grain and one for mash.

4 FINELY cut, tender green feed may be given to the chicks any time after they have had their first feed and it is advisable to feed it to them daily thereafter. Do not feed it on the floor, but use poultry netting racks or baskets for them to pick it from.

5 **BABY** chicks must have clean water to drink with their first feed. It is not desirable to put anything in the drinking water. The water should have the chill removed. The ordinary chick water fountain with a water pan not less than 8 inches in diameter is sufficient for not more than 50 baby chicks during the first two to three weeks. It must be cleaned and filled at least twice daily and at more frequent intervals if needed. One hundred chicks more than two weeks old will need a three-gallon fountain filled at least twice daily. Clean water for the baby and growing chicks must not be neglected. Chicks require enormous amounts of water for the rapid and complete digestion of the great amount of feed they use to make rapid growth. Unless clean water is provided for them, they will drink what they can get. Dirty water is almost certain to cause sick and disordered chicks. Lack of water will result in dried up, runty, and weak chicks. As chicks grow, the supply of clean water must always be abundant.

6 **LIQUID** milk is fine for chicks but has its dangers. It must be clean and put out in clean fountains. There must be no drip or overflow of the milk. Conditions in feeding milk must be such as not to attract flies or permit a breeding place for flies to develop. Use two sets of fountains for milk and



Arrangement of intermediate feeders for chicks after three weeks in the brooder. Note water founts set on bricks to prevent chicks scratching litter into the water.

sun the idle set during the day it is not in use. Liquid milk does not take the place of clean water. Feed milk either sweet or sour, preferably sour, but always clean and not so sour as to be spoiled. Much of the value of milk is lost when made into curd or cottage cheese, which is greatly overestimated as to its value for chicks. Feeding liquid milk does not justify a change in the formula of the mash used.

7 GRAIN is added to the diet of the chicks when they are 3 to 6 weeks old. At this time, double the number of feeders and put equal parts of whole oats, kafir, wheat and cracked yellow corn in the new feeders. Do not use what is called chick-size grains. They are too fine and the waste and cost is excessive. Never start baby chicks on grain as their first feed. There is not enough protein to give them a quick start. Liquid milk with grain is extensively used to start baby chicks, but better fryers and pullets would result if a chick mash of 17 or 18 percent protein were used to start them as baby chicks.

8 CONTINUE feeding the chicks with an equal amount of this same mash and grain until the pullets are starting to lay, when they may be switched to a laying mash which is equally as good as this chick mash.

9 SUPPLEMENTAL to feeding each chick has at least seven square inches of floor space in the hovering area and 48 square inches of floor space in the brooder house. About one-half of the brooder floor, including that under the hover, is covered with clean, dry, coarse sand. The other half of the floor is covered with chopped alfalfa hay or other suitable litter. The hover has a temperature of 90 to 95 degrees F. at the edge of the hover and one inch from the floor and there is a maximum of fresh air and light allowed in the brooder house, and no drafts, especially no floor drafts.

10 THIS is *one* successful method of feeding chicks.

11 COMMERCIAL baby chick mash is suitable to use with this way of feeding growing chicks, provided it has not less than 17 percent protein guaranteed on the feed tag. (It need not be more than 19 percent protein.) The guarantee for fiber should be not less than 6 percent nor more than 9 percent for the best results. There should be bran, yellow cornmeal, alfalfa meal, dried milk, poultry meat and bonemeal, salt and a vegetable protein, preferably cottonseed or soybean meal in a good chick mash. Fish liver oil or other sources of vitamin D are not essential in Oklahoma unless the chicks are in strict

confinement and not allowed to be in outside sunshine for a period of longer than one week. This does not happen often in Oklahoma during the chick season. Charcoal is of no use or value in a chick mash and even may be detrimental in rations of borderline vitamin content.

Feed Pullets and Cockerels Separately.—How fast chicks should grow is a debated question. It is certain that cockerels to be sold as broilers at 10 to 14 weeks of age can be pushed for maximum rate of growth. Pullets need not be rushed as the cockerels are. It seems reasonable that pullets will be best when developed at a normal rate. This indicates the desirability of separating pullets and cockerels at an early age. Continue the cockerels on the all-mash feed and add grain to the pullets' feed. Cockerels under this schedule will weigh one pound in five to seven weeks and eat three to five pounds of feed in that time.

The majority of cockerels should reach two pounds by 10 weeks, a few of the smaller ones requiring 11 to 12 weeks. In this time each fryer will eat five to seven pounds of feed. A more rapid growth rate than this should be expected from flocks where effective selection for growth has been practiced.

GET THE CHICKS OUTSIDE

Get the chicks out into the sunshine early. The saying used to be "get them out on the ground early," but it is definitely known that chicks can be successfully grown and never touch ground. In some sections where soil contamination is a problem, the only yard the chicks know is a concrete court. Sunshine through muslin or glass substitute is somewhat better than sunshine through ordinary glass, but direct sunshine is best. For early season chicks, it is essential that they be protected from wind so that they will take advantage of the sunshine. The need for Oklahoma farmers to feed cod liver oil is not so acute as in other parts of the country if advantage is taken of the sunshine and the opportunity to grow green feed.

Chicks on clean, fresh range will pick up some green feed, but seldom will there be enough to fill the demands of the growing chick. Without all the green feed the chicks need, a condition resembling roup develops. The condition does not develop rapidly and it takes a large part of the growing season to be noticeable. In the fall, when it is noticed, little can be done to correct the damage. The pullets will be thin, have watery eyes and nose, and a general lack of luster of feathers.

The mouth and throat will have a coating of white mucus with distinct but small pinhead white spots. This trouble is caused by lack of vitamin A in the chick ration. Comparatively few feeds used for poultry are adequate in vitamin A and those that do contain it must be used if pullets are to be raised with complete success.

In many sections of Oklahoma most pasture and wild green feeds dry up in July and August. There is a particular necessity for chick green feed at this time of year. Since green feeds are the cheapest source of vitamin A, special plantings should be made for the chicks.

Yellow corn is the only grain used for poultry that has a relatively large amount of vitamin A. White-seeded kafir and hegari have a small amount. Wheat bran has a small amount. Fish liver oil, whole milk, eggs, tomatoes, and green alfalfa contain large amounts of vitamin A. Skimmed milk, dried buttermilk or dried skim milk have small amounts but not enough to do the job for chickens without help. The feeding of yellow corn helps, but is not enough; and perhaps as many chicks are raised in Oklahoma without yellow corn as with it.

Each fall and winter when pullets should be ready to lay, letters come to the Oklahoma A. and M. College poultry department describing pullets that have been raised without enough vitamin A which is the same as without enough green feed. It is not possible to overemphasize the necessity of green feed for growing pullets. Free range is not the same as green feed. Most free range after June does not have green feed that growing pullets can use. Tall-growing grain or sudan grass is of little benefit, for the pullets cannot pick it off. The tall, green grass must be chopped or cut into short lengths so the pullets can pick it up and swallow it. Chickens have no way of cutting, chopping or chewing tall, tough, green feed, but can use it if in one-fourth to one-eighth inch lengths. Where sudan grass is planted in rows on the chick range it is an excellent practice to cut alternate bunches close to the ground. This induces growth of tender new grass which is the most beneficial kind for chickens.

This thin and roup-like condition from the lack of green feed is more noticeable when the chicks have had a diet of wheat or other grain that is too low in protein to force the pullets to normal physical growth and development. Pullets cannot be developed into profitable producers on any combination of grain without suitable protein concentrate supplement.

PLANT GREEN FEED

For the 300-hen unit, plant two 300-foot rows or equivalent of Lucullus swiss chard for summer green feed for the chicks and hens. Each day, break off enough large, outside leaves to weigh 10 pounds for the hens, and from one to about 12 pounds each day for the chicks as they grow larger. Chop into one-fourth to one-half inch lengths and feed in a clean trough. Two feedings each day will increase the amount the chickens will eat. When the chard is struggling with dry weather, use sudan grass to relieve it. At any time the sudan grass is getting too tall, use it and give the chard a growing period. This is best done by cutting alternate bunches in alternate rows, which promotes the growth of new, fresh, tender, green sprouts.

Plant a 200-foot row or its equivalent of sudan grass for summer green feed for chicks and hens. Cut and chop when it is between 24 and 36 inches tall. Use sudan to give swiss chard an opportunity to grow larger. The sudan grass cut from two or three feet of the row should be enough to feed hens and chicks for one day. Plant a 200-foot row or its equivalent of Danvers Half Long yellow carrots for winter feed. Grind them in household food chopper for feeding. Use in November, December, January and February.

Alfalfa, sweet clover, green cabbage leaves, rape or other greens are good in season but it is not enough to depend on what happens to be handy. Guarantee green feed for the chicks by planting chard, sudan, carrots or other greens especially for that purpose.

SEPARATE AND SELL THE COCKERELS

Cockerels should be separated from the pullets soon after sex difference is noticed. Cockerels 8 to 12 weeks old will have back feathers more distinctly pointed in shape than pullets. No special fattening feed is desirable for the cockerels. They only need to grow as rapidly as possible in order to be good market broilers or fryers when 10 to 12 weeks old.

It is possible, but not the best practice, to keep pullets and cockerels together until the cockerels are ready for market.

It is not profitable to carry the cockerels of light weight breeds much longer than 12 weeks. Their value goes down and the cost of feeding them increases rapidly. Cockerels of heavy

weight breeds make the best roosters and honest buyers should pay an honest price for them when 16 to 20 weeks old and weighing five pounds or more. These breeds must not be so old or so slow in growth as to be other than soft meated.

VACCINATION

On farms where chicken pox has been a cause of serious winter loss of pullets and eggs, it is advisable to vaccinate the pullets when 4 to 12 weeks old. Do not wait until the pullets are more than 12 weeks old or are laying eggs. The vaccination must be before they are 12 weeks old for good results. The Oklahoma A. and M. poultry department recommends the use of a live virus vaccine applied by the wing stick method. The best vaccine is that in which the live virus is supplied in dry form in one container and the liquid diluent in another. The two are mixed before using. Empty containers and left-over vaccine should be destroyed by burning.

EQUIPMENT AND APPLIANCES

SUMMER HOUSE

With a 300-hen unit on the farm, a summer growing-house is necessary for the pullets. This is a 10x12 gable-roof shed equipped with perches and with one-inch mesh poultry netting or fox wire floor and sides. Fox wire is similar to poultry netting, but made from heavier gage wire. The floor is 12 or 14 inches above the ground so the droppings will be out of reach of the pullets. At frequent intervals the house can be pulled aside and the droppings hauled away. The house is then pulled back over the same spot or moved to an entirely new, clean range.

RANGE FEEDERS

Six 3-foot, trough-type, reel-top feeders are desirable for each 300-hen unit on the farm: two feeders for mash and one feeder for grain for each 150-hen unit. Keep the feeder under a shelter so that the chicks can eat any time during the day and be protected from sun or rain. Sun and rain cause deterioration in value of feed and loss by spoilage. Two waterers for each feeding shelter are needed.

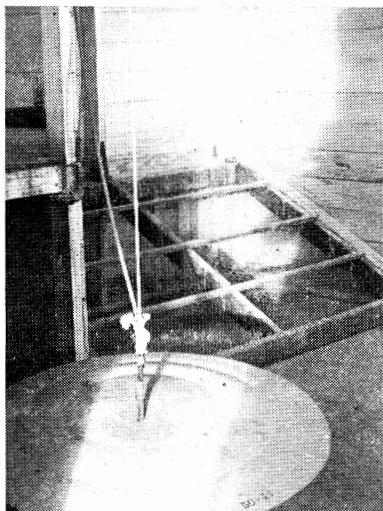
WATER CONTAINERS

A satisfactory water fountain is so arranged that the chicks can get plenty of water to drink without drowning and

high enough to prevent the chicks from filling the fountain with dirt and litter by scratching. For baby chicks, a fountain that screws on a glass fruit jar is satisfactory. One jar fountain will water not more than 20 chicks.

A vacuum type feed water fountain is better for large broods of chicks. Fountains less than 8" in diameter or less than one gallon capacity are not large enough for economy in labor and size for a supply of water. The desirable fountains have a drinking ring so designed that it is difficult if not impossible for the chicks to get into the water. For day old chicks the fountain is on the floor. As the chicks grow, the fountain should be elevated to prevent filling the drinking ring with litter when the chicks scratch.

For older chicks, an open and larger pan or crock is suitable. A wood or wire frame is arranged around it so the chicks



Brooder house equipped with suspended gas-burning brooder stove and desirable type of chick perches.

can put their heads through to drink, but not get into the water with their feet. On the range, a shelter with raised and slatted floor is desirable for the water pan. At all times the arrangements should be such that puddles of water are not allowed to stand where the chicks can wade and drink in them.

If shade is available to protect a barrel, it is a labor-saver to haul water to the chick range. A drip valve or float valve with overflow pipe in the water pan assures water for the pullets all the time if there is water in the barrel.

PERCHES

Flat perches should be available to the chicks by the time they are three weeks old.

They will begin to form the habit of getting on perches then if perches are available; otherwise, they will begin to form the habit of roosting on the floor. Watch the chicks hop on the perches during the day and enjoy life. Crooked breast bones are not likely to be caused by early perching if the chicks are properly fed and perches are not too narrow. One- by two-

inch strips nailed to a frame covered with one-inch mesh poultry netting make splendid chick perches. The top should not be over 12 inches high, and the bottom may be only two or three inches from the floor on a sloping set of perches four feet square. The bottom one or two perches might even be under the edge of the hover to good advantage.

If shade is available to protect a barrel, it is a labor-saver to haul water to the chick range. A drip valve or float valve feet square. The bottom one or two perches might even be under the edge of the hover to good advantage.

LIGHTS

It is necessary to visit the chicks after dark. On such visits it is best not to throw a direct light on the chicks as they will crowd away from it and not move back to their original positions when the light is taken away. If a flashlight is used, throw the ray or beam on the ceiling or walls and work by the reflected light. If a permanent electric light is used, arrange a reflector that will keep the direct light off the chicks. With a lamp or lantern a reflector can be attached that will throw the light away from the chicks in a satisfactory manner.

SUMMARY: CARE OF CHICKS

Keep the chicks growing by keeping them happy, contented, and full of feed. As soon as they are in the brooder, begin the task of providing green feed and shade for them during the coming summer. If trees are not available, alternate rows of sunflower, sudan grass, and corn or kafir should be planted. These will provide shade during the summer. Keep the mash feeders and waterers in the shade so the chicks will eat more during the day. Green swiss chard and sudan are fine for summer. Green feed must be cut and chopped into quarter-inch lengths and fed by hand if best results are to be obtained.

COST OF BROODING

The biggest cost of brooding chicks is mortality. Anything done to lower the loss of chicks will reduce the cost of brooding. Investment in good and sufficient equipment will, time after time, be repaid by increased number of chicks raised. The pullets raised out of chicks properly brooded will be able to repay in numbers and quality many times over the cost of good brooder equipment.

A very large cost of brooding is the equipment cost. Frequently economy is practiced by purchasing inexpensive and cheap equipment. This is often false economy because cheap equipment is frequently inefficient. Much of the cost of equipment is caused by careless handling and destruction of equipment. It is not uncommon to find fully grown broods roosting on the brooder stove. Occasionally brooder stoves are left outside and exposed to all kinds of weather. Good care of brooding equipment will make it usable for many seasons. Clean and store all parts of the brooder stove, chick feeders, fountains, etc. immediately when their period of use is completed each season.

FEED FOR GROWING PULLETS

Pullets ten weeks and older need not have as much protein as baby chicks. Pullets, to lay well and remain strong and healthy, must be full grown physically before the first eggs are laid. This requires a fine attention to the balance between sexual and physical development.

The baby chick mash suggested in the A. and M. Way to Feed Chicks can be used. Grain should be fed with about equal amounts of the mash. Splendid results have been had with the range feed hopper by using half of it for grain and half for mash. The pullets will eat about equal amounts of each.

Grain mixtures are not especially important. Almost any combination of three or more grains is good if the mash used with it is adequate. As much as one-fourth of the grain can be whole oats. Yellow corn can make up one-fourth of the grain. Kafir, wheat, milo, barley or feterita can be used to complete the grain mixture.

The poorest way to feed grain to growing chicks is to scatter it on the ground or to feed sorghums in the head. Hopper or trough feeding is the best method to use with growing chicks.

Keep the pullets on a growing mash and grain until they are in good production if that is before October 1. After October 1, they can be rushed just a little to get them into fall production. Heavy breed chicks hatched before March 20, and light breed chicks hatched before April 20, should, if these directions have been followed properly, be in good production on or before the first of October. Keep the pullets growing. Feed fresh green feed every day.