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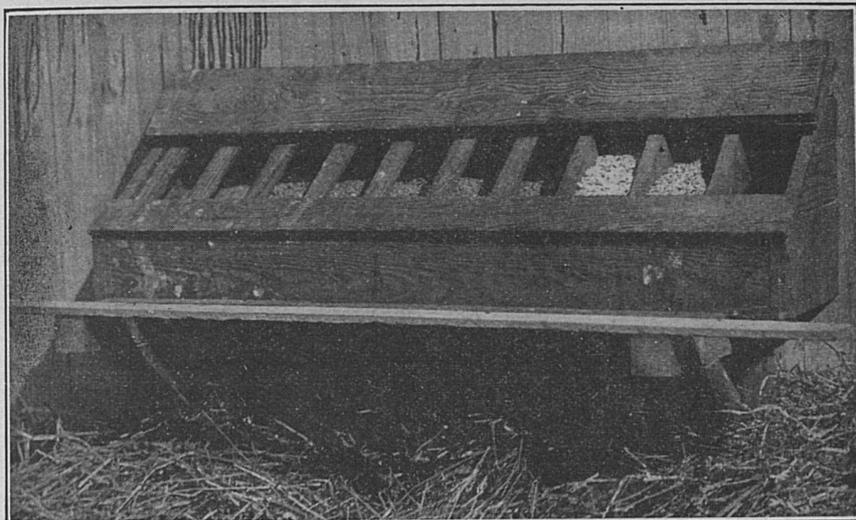
COLLEGE OF AGRICULTURE

Extension Division

THOMAS P. COOPER, Dean and Director

CIRCULAR NO. 186

FEEDING FOR EGG PRODUCTION



Dry mash feed hopper for laying hens, placed on a platform to allow maximum floor space, and to keep straw out of the mash. (Note the three compartments in the right hand side for oyster shell, grit and charcoal, respectively.)

Lexington, Ky.

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FEEDING SUGGESTIONS.

It should be remembered that no one ration will fit all conditions. The cheapness and availability of the feeds should be considered. Ready-mixed poultry mashes are very satisfactory and, if readily available and not too high priced, may be fed.

If corn and corn meal are the only available feeds, a dry mash of three parts corn meal and two parts meat scrap should be fed with the whole or cracked corn. In this case the birds should be made to consume twice as much grain as mash, by weight.

Feeding should be done at regular hours, preferably twice a day, once in the morning and once in the evening.

Keep the water pans clean and filled with pure, fresh water.

If skim-milk is fed, avoid changing from sweet to sour, or the reverse. It is best to feed sour milk continuously.

While the appetite should always be kept keen, nevertheless the birds should be fed all they want to eat.

Feeding is but one of the four essential means of securing high egg-production. The other three are: pure-bred birds of high-laying strain; strong, vigorous and healthy birds; and a comfortable house with plenty of room for exercise. From this it may be seen that correct feeding alone cannot give maximum egg-production.

CIRCULAR NO. 186

FEEDING FOR EGG PRODUCTION

By J. HOLMES MARTIN

A goodly profit from the poultry flock is largely dependent upon the production of eggs during seasons other than the spring months. In order to secure high egg production in the late summer, fall and winter it is absolutely necessary that the hens be properly fed. Probably two-thirds of the hens in Kentucky fail to lay their maximum because they do not get the proper food to make eggs. That all flocks lay well in the spring is well known to all farmers. Heavy spring laying may largely be accounted for by the fact that during the spring months there is an ample supply of animal food in the form of insects and worms, much tender green, succulent material and plenty of sunshine. If egg production is desired during other seasons of the year it is essential to make feeding conditions as near like those in the spring as is possible.

To offset animal protein supplied by insects and worms during the spring months, some form of milk or a mash containing tankage or meat scrap should be fed thruout the year. If an ample supply of skim-milk or buttermilk is available (at least 1 gallon daily for each 25 to 30 hens) it is not necessary to feed a dry mash.* However, as there is likelihood of a shortage of milk on all farms at certain seasons of the year, it is well to have available in a self-feeder at all seasons of the year a dry mash containing some tankage or meat scrap. Then, in event of a shortage of milk, the proportion of tankage or meat scrap in the mash may be increased, whereas it may be considerably reduced when ample milk is available. When as much as 4 gallons of milk is available for 100 hens, daily, the tankage or meat scrap may be reduced to as low as 5% of the mash, by weight. When only two gallons of milk are available for each 100 hens, daily, the amount of tankage or meat scrap should be increased to from 10% to 15% of the mash by weight. If, for any reason, the supply of milk

*See Exp. Sta. Bull. 260 for data on this point.

should be cut off, the proportion of tankage or meat scrap in the mash should be raised to 20%. Unless some tankage or meat scrap is to be included in the mash, the entire mash had just as well be omitted. A mash consisting solely of ground grains and mill by-products has no effect on increasing egg production and is not very appetizing to the hens. Its chief advantages would be in supplying something to eat should the grain be forgotten and in keeping the flock in the habit of eating mash.

NECESSITY OF ANIMAL PROTEIN

The fact that animal protein is essential is clearly brought out by an experiment covering a period of twelve months, conducted at the Kentucky Experiment Station poultry farm.

Thirty S. C. White Leghorn pullets were divided into two pens of 15 each, both pens receiving the same grain ration. Pen 1 received a mash of equal parts corn meal, bran, middlings, ground oats and meat meal, while Pen 2 received the same mash without the meat meal. Pen 2 averaged but 23.6 eggs per bird for the year, while the meat meal pen averaged 124.2 eggs per bird, showing that the addition of meat meal to the mash increased the egg production about five times.

Tankage, which is widely used in hog feeding, will produce equally as good results as meat meal. However, it is necessary that only tankage of good quality be used in poultry feeding. Tankage containing 60% protein usually gives much better results in poultry feeding than the tankages containing less protein and is more economical in the long run. The best grade usually is manufactured from fresher materials.

SKIM-MILK

That an abundance of skim-milk added to a ration consisting of a grain mixture and a mash of equal parts corn meal, bran, middlings and ground oats will produce equally as large an increase in egg production as meat scraps is also brought out by a further experiment at the Kentucky Experiment Station poultry farm.

Forty White Wyandotte pullets were divided into two pens of 20 each, both pens receiving a grain mixture of 70% shelled corn and 30% oats, and a mash mixture consisting of equal parts by weight of corn meal, bran, middlings and ground oats. Pen 2 received, in addition to the grain and mash, all the skim-milk they would consume but no water, while Pen 6 received only water to drink. From November 1st to June 30th (8 months). Pen 2 averaged 98.5 eggs per hen while Pen 6 laid but 28.5 eggs per hen, in this time, which is scarcely one-third as many eggs. Observations on Pen 6 showed that between July 1st and 9th only 3 of the 17 re-

maining hens were laying and the entire flock was either in a molt or just starting. The three hens which were in laying condition only laid a total of 5 eggs in the first nine days of July. On July 10th, skim-milk was added to the ration of Pen 6. This resulted in an almost immediate postponement of the molt and the entire flock came back into production. During the last four months (July 1 to October 31) of the test, these hens averaged 32 eggs each as against only 29.5 eggs each during the eight preceding months which included the four spring months of normally heavy egg yield. A comparison of Pens 2 and 6 is of interest.

	Pen 2	Pen 6	
		Nov. 1 to June 31	July 1 to Oct. 31
Average No. of winter eggs.....	34	13
Average egg production	145*	28.5	32
Feed cost per dozen eggs.....	13.3c	27.7c	18.7c
Net return over feed	\$53.34	\$5.39	\$6.52

* Yearly average.

It should be noted that it cost practically twice as much in feed to produce a dozen eggs where no skim-milk was fed. In other words, the use of milk not only increased the number of eggs but in turn reduced the cost in feed of producing eggs. A comparison of the net return over feed shows that the profit from the flock is greatly increased by the use of milk. Whereas, Pen 6 only returned \$5.39 over feed cost, during the first eight months (and would have returned little if any more had the pen been continued without skim-milk) the use of skim-milk continuously in Pen 2 resulted in a net return of \$53.34 for the year, or practically ten times the profit of Pen 6.

RATIONS

A balanced ration for laying hens consists of a suitable grain mixture, either ample milk or a mash containing a high-protein concentrate, and ample provision for the mineral requirements of the hens' bodies and the production of egg shell. The basis of the grain mixture in Kentucky is corn. If corn is the only grain available it may be fed either shelled or cracked provided ample animal protein is supplied to offset the fattening effect of the corn and balance up the ration (narrow the nutritive ratio). However, it is desirable to add other grains to corn. If wheat is available and not too high in price it may be added to the grain mixture to advantage. Wheat, if used, should comprise from 20 to 30% of the grain mixture. If the oats available is of good quality and not too light (not under 30 pounds per bushel) it will make a desirable addition to the grain mixture. On account of the high fiber content of the oat hull, oats should

never comprise more than one third of the grain mixture. Barley is well liked by fowls and is a very desirable grain to add to the mixture when available and not too high priced. It may compose from 10 to 30% of the grain mixture. Rye is unpalatable and tends to poison fowls, causing limberneck, and should never be used in the grain mixture. However, green rye is highly palatable and an excellent source of succulence for the laying flock. On account of the poisonous effect of the grain, the flock should be kept away from ground just sown to rye.

DESIRABLE GRAIN MIXTURES

	Pounds	Quarts
(1) Corn (shelled or cracked)	50	30
Wheat	25	13
Oats (heavy)	25	25
	100	
(2) Corn	40	24
Barley	20	13½
Wheat	20	10½
Oats (heavy)	20	20
	100	
(3) Corn	70	42
Oats (heavy)	30	30
	100	
(4) Corn	70	42
Wheat	30	15¾
	100	

Any one of these grain mixtures may be used, whether milk or a mash containing tankage is the source of animal protein. If corn, wheat and oats are all available for the laying flock one of the most satisfactory methods of feeding them during the fall and winter is to scatter the wheat in the straw litter in the morning, feed the oats, either germinated or sprouted, at noon, and feed the corn (shelled or cracked) in the straw litter about an hour before roosting time. About twice as much corn (by weight) should be fed in evening as is fed of the wheat in the morning. The advantages of this method are that the wheat in the straw litter furnishes ample scratching during the forenoon, whereas the germinated oats at noon furnish succulence, and is more digestible than the dry oats would be in the grain mix-

ture, acting somewhat as an appetizer. Then the corn fed in the evening enables the hens to readily fill their crops on a grain that supplies the most heat during the long, cool fall and winter nights. Such a method gives the flock a variety and at the same time avoids the labor of mixing the grains.

DRY MASH MIXTURES

Pounds		Pounds	
(1) Shipstuff*	300	(2) Shipstuff*	200
Ground corn or corn meal.....	100	Ground corn or corn meal.....	200
Tankage or meat scrap.....	100	Tankage or meat scrap.....	100
	500		500
(3) Bran	100	(4) Or, if wheat by-products	
Middlings	100	are not available:	
Ground corn or corn meal.....	100	Ground corn or corn meal.....	300
Ground oats	100	Ground oats	100
Tankage or meat scrap.....	100	Tankage or meat scrap.....	100
	500		500

* Mixed wheat feed or mill run of bran and shorts.

Any one of the above mash mixtures may be fed with any of the grain mixtures or with corn alone if other grains are not available.

Salt should be added to the dry mash of the laying hens. From ½ to 1 pound (and not over 1 pound) of table salt or dairy salt should be sprinkled well over each 100 pounds of mash and thoroly mixed with it. Be sure that all lumps of salt are thoroly broken up.

The dry mash should be kept available in open self-feeders or hoppers at all times. If the main supply hopper does not furnish enough room for a large share of the flock to eat mash at one time, additional troughs or pans should be provided and so arranged that the hens cannot get their feet in the mash or "bill" the mash out on the floor with their beaks.

MINERALS

In addition to the salt, which comprises ½ to 1% of the dry mash, other minerals should be supplied. Oyster shell or a good grade of ground limestone (low in magnesium content) should be kept in open boxes or hoppers, to supply shell-forming material. Most Kentucky ground limestones (particles varying from the size of wheat grains to corn grains preferred) are sufficiently high in solubility and availability of calcium to meet the requirements of the laying flock.

The necessity for the shell-forming material is indicated by an experiment conducted at the Kentucky Experiment Station poultry farm from



Fig. 1. A Self-Feeder in Use.

January 1, 1918, to May 31, 1918, with sixty late-hatched S. C. White Leghorn pullets. The pullets were divided into four pens of 15 birds each, as nearly alike in size, vigor and development as possible. The birds were kept housed thruout the experiment, in the same kind of houses, and fed the same ration. The only varying factor was that of the shell-forming material and grit.

The pens were divided as follows:

	Average egg production per hen for 5 months.
Pen No. 1. No grit, no oyster shell.....	31
Pen No. 2. Grit only	29
Pen No. 3. Both grit and oyster shell.....	48
Pen No. 4 Both grit and ground limestone	54

It may be seen from this table that lime is a limiting factor in egg production* and that it may be furnished in the form of oyster shell or ground limestone. The grit used contained little or no lime and did not supply shell-forming material.

On the average Kentucky farm where the flock has free range no grit need be supplied, as the hens can pick up pebbles or gravel. However, with commercial flocks, back-yard flocks or flocks confined to the house several months, gravel or a granite grit should be supplied.

Charcoal absorbs gases and acts as an intestinal purifier. It may be kept in open hoppers or added to the dry mash to the extent of 1%.

In event a high vegetable protein concentrate such as cottonseed meal, soybean meal or peanut meal is added to the mash, then ground rock phosphate or bone meal should also be added to the mash to the extent of from 2% to 4%, to supplement the salt (which is in the mash) and the ground limestone or oyster shell (which is in the separate hoppers) and thus complete the mineral requirements.

TONICS

The use of condiments or tonics affords an unnecessary expenditure of money in event a well balanced ration is fed. The same money invested in those materials needed to balance the ration (usually tankage or milk) should bring equally good or even better results. If a stimulant is desired, a pinch of red pepper or ginger should be added to the regular mash, and fed moist. That stimulants or tonics are not necessary when hens are properly fed is clearly shown by a test run at the Kentucky Experiment Station poultry farm.

On January 1, 1921, sixty White Leghorn pullets were divided into three pens of twenty each, on the basis of their November and December production. These pullets had been in the same pen but had not been laying well during November and December, due to a partial molt. The three pens were continued on the same grain mixture and the Experiment Station mash (Mash No. 3, page 7). Starting January 1, a wet mash was fed every noon to each of the three flocks. In the check pen nothing was added to the mash, in the second pen a widely advertised egg tablet was added, and in the third pen an egg tonic which is also widely advertised was added, according to instructions on the box. The production of each of the pens up to April 10 (100 days) when the experiment was discontinued is stated in the table on the next page.

* Further experiments have shown that hens receiving no oyster shell or limestone not only lay fewer eggs, but also those eggs laid are much lower in hatchability than when lime is supplied.

	Check (No Tonic)	Egg Tablets	Egg Tonic
January	121	131	178
February	161	139	187
March	298	322	246
April 1-10	105	108	51
Total	685	700	662
Average 100 days	34.3	35	33.1

This shows that no appreciable increase in production was caused by the use of these widely advertised egg tonics. Probably the chief reason that they give satisfaction is the fact that the directions for their use demand that they be fed with a mash. In all probability it is the better feeding conditions that bring about the increased production and not the use of the tonics.

SUCCULENT FEED

Green feed is desirable for the laying flock because of the fact that it supplies certain essential food factors known as vitamins. If white corn is used in the grain mixture and commercial corn meal (without the germs) in the mash, then green feed is practically a necessity. On the contrary, if yellow corn is used as grain and ground yellow corn (germs as well as starchy portions) in the mash, then green feed is not an essential in feeding laying hens. However, its use will deepen the yellow color of the egg yolks, which is in many cases to be desired. It is well known that green feed is quite essential for the breeding hens, as its use increases the hatchability of the eggs. If green feed is not supplied laying pullets they should be given epsom salts at the rate of one pound per 100 hens (in the drinking water) once each month, to cleanse the digestive tract and offset the succulent effect of green material.

Sprouted oats afford an excellent source of succulence during fall and winter. If the sprouts are placed close to the window where they may receive sunlight, their green color will add richness to the yellow color of the yolk. Altho this is desirable, yet in many cases it is advisable to feed oats when the sprouts are about $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long. Such oats are commonly referred to as germinated oats and may be prepared as follows:

Bore one or two small ($\frac{1}{2}$ in.) holes in the bottom of each of 5 or 6 wooden candy pails or lard tubs. Have one pail or tub without holes for soaking the oats. Fill this pail half full of dry oats and add enough lukewarm water to cover the oats to a depth of about 2 inches. Allow the

oats to soak over night (about 12 hours) then pour off the water and empty the oats into another pail, in which the holes have had plugs inserted, and allow the oats to soak in warm water for 5 minutes. Stir the oats a time or two and then take the plug out of the bottom of the bucket and drain off the water. After that, morning and evening empty the oats from one pail to another, fill with warm water, let stand five minutes and stir before draining off the water. A new bucket of dry oats should be put to soak each evening. Keep the pails in a warm place and covered with a wet cloth. After 5 or 6 days of alternate soaking, stirring and draining, the sprouts should be long enough to feed. The pails should be scalded with hot water each time before starting a new lot.

Under Kentucky conditions a good clover or alfalfa pasture, supplemented by a patch of green rye will provide the flock with ample succulence thruout most of the year. If, in addition to the pasture, the flock is given access to alfalfa or clover chaff or hay, especially when the weather conditions are such that the flock remains close to or in the house, the green feed requirements of the flock will be met.

Broken stems and leaves of alfalfa or clover hay such as are found on the hay mow floor are excellent for poultry feeding and, except when musty, may be fed to advantage. They may be steamed with boiling water and fed in a moist mash or the dry chaff may be scooped up and put into the henhouse where the hens can help themselves.

Cabbage and corn silage are other desirable sources of green food. When fed silage in small amounts the hens will generally pick out the leafy part that is cut rather fine. Mangel beets, while furnishing succulence, do not supply the vitamin factors to be desired in green feed and hence are not particularly advantageous. If root crops are desired, a heavy-yielding sugar beet is to be preferred to mangels.

METHOD OF FEEDING

Exercise keeps the hens in the best physical condition, thus enabling them to avoid diseases and lay well. One of the best ways to induce exercise is to feed all the grain in a deep straw litter. It should be scattered well into litter from 6 to 10 inches deep; about $\frac{1}{3}$ the total amount early in the morning and $\frac{2}{3}$ in the evening. The birds should be made to scratch hard and work hard for every grain they get. One of the secrets of good feeding is to send the hens to roost with full crops and yet make them eat eagerly every grain they get. The only advantage of feeding cracked corn in place of shelled corn is that it induces exercise. However, if the grain mixture contains some wheat, oats or barley, this will afford considerable searching in the litter and shelled corn will do quite well.

Unless skim-milk or buttermilk is available continuously in liberal amounts, as the source of animal protein, dry mash should be kept before the flock in open self-feeders at all times. (See Figs. 1 and 2 and cover cut). The proportion of grain to mash is quite an important

factor in feeding. During the fall and winter more grain is needed to supply body heat and to put the birds in good flesh. During the spring months less grain is needed, while during the summer considerable mash is required, as it has a more cooling effect than grain and also aids considerably in holding the hens up in late summer and fall production. Since it is rather difficult to measure or weigh the mash consumed, keeping check on the grain consumption affords the easiest means of gaging the proportion of grain to mash actually consumed. If the daily feed requirements of the flock are known and the amount of grain fed is checked carefully, then it may safely be assumed that the hens will consume the difference in the form of mash. From figures gathered at the Kentucky Experiment Station and other stations the following approximate amounts are computed:

FEED CONSUMPTION OF LAYING HENS

Breed	Total Per Hen Per Year.	Daily Per 100 Hens. Lbs.
Leghorn	75 lbs.	20 lbs.
Wyandotte	80 lbs.	22 lbs.
Rhode Island Red	85 lbs.	23 lbs.
Plymouth Rock	90 lbs.	24½ lbs.

If it is desired to feed Leghorns twice as much grain as mash, then about 13 to 14 pounds of grain should be fed daily to 100 hens and with this they will consume about 6 to 7 pounds of the mash. For Plymouth Rocks about 16 pounds of grain should be fed daily and the hens would consume close to 8 pounds of mash. Of course the amount of feed consumed daily depends upon the age of the birds, their condition and their size as well as breed. The approximate proportions of grain to mash are given, to serve merely as a guide. These proportions will vary according to the ingredients of the mash, time of year, weather conditions and state of production. The physical condition of the hens and their condition of flesh must be the ultimate guides.

APPROXIMATE PROPORTIONS OF GRAIN AND MASH FOR 100 HENS (LEGHORNS)

Month	Amt. Grain to Feed Daily. Lbs.	Amt. Mash Hens Should Consume. Lbs.	Desired Ratio Grain to Mash
October (pullets)	14 to 15	4 to 5	3:1
November thru February..	12 to 14	5 to 8	2:1
March	11 to 12	8 to 9	1½:1
April thru June	10 to 11	9 to 10	1:1
July thru October.....	8 to 10	10 to 12	¾ (to 1):1

It should be kept in mind that this table gives only approximate amounts and applies to Leghorns. For heavier breeds the grain fed daily should be increased in proportion to the daily requirements per 100 hens of that breed as shown in the previous table.

ARTIFICIAL LIGHTS

The use of artificial lights for the flock of laying pullets has come into rather common practice among commercial poultrymen in Kentucky. The use of artificial lights lengthens the hen's working day, thereby approaching spring conditions and making it possible for her to consume a greater amount of feed. Since during the winter months, the cold nights require considerable feed to meet the maintenance requirements, this extra consumption of feed is rather an important item in stimulating high winter egg production. Little good is accomplished in lengthening the day and thereby increasing feed consumption, unless a balanced ration such as those suggested in this circular is being fed.

An experiment covering three years was run at the Kentucky Experiment Station poultry farm in which during the winter months one pen was lighted from 4:00 a. m. until daylight, whereas, the other pen received no artificial lights. In each pen were 70 S. C. White Leghorn pullets and 30 Leghorn hens. On the basis of a three-year average, the pullets in the lighted pen layed 6 more eggs per bird, from November thru February, than the pullets in the unlighted pen. The yearling hens in the lighted pen averaged to lay 12 more eggs per bird than those in the unlighted pen, from November thru February. This was due chiefly to the fact that the lights hastened the yearlings thru their molt and got them back into production during November and December, whereas those in the unlighted pen did not come back into heavy production until January. However, the stimulating of hens into November and December egg production would not be desirable if such birds were to be used as breeders, as heavy winter egg production tends to lower the hatchability of their eggs. Both the pullets and the hens in the unlighted pens, while not laying as well during the winter as those receiving lights, laid better during the spring and summer, and during the year averaged to lay as many eggs as those receiving lights. In other words, the use of artificial lights did not increase the total number of eggs, but increased the number of winter eggs, which, of course, is to be desired when the flock is kept chiefly for egg production. In case artificial lights are used, under Kentucky conditions, it is advisable to commence them November 1st and run thru until the first half of March. If lights are to be used on breeding hens they should not be turned on until the first of January. If the lights are turned on from 4:00 a. m. until daylight, the grain should be scattered in the straw litter the night before in order that the birds can start scratching and working as soon as they leave the roosts.

Another plan in the use of lights is to turn them on between 8 and 9 o'clock in the evening and leave them on for about half an hour. Grain should be fed at this time as an "evening lunch." Sometimes it is advisable to feed the grain given for the "evening lunch" in troughs so that the birds can eat it quickly and go back to roost.

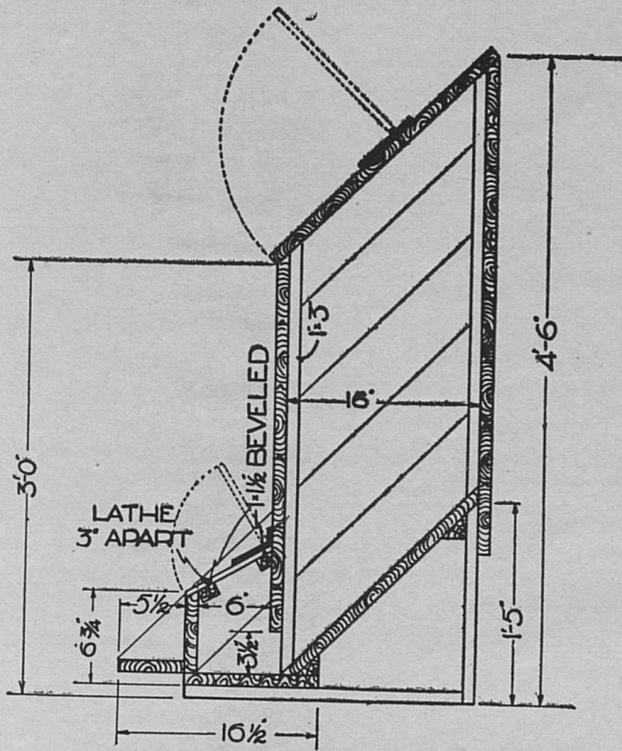
When artificial illumination is used, it is quite necessary to take due precaution not to "force" or overstimulate the flock. It is generally considered that a production in excess of 50% (50 eggs daily per 100 hens) is abnormal during the winter months and may result in a partial molt followed by colds and other troubles.

FEEDING BROODY HENS

It is a bad practice to starve broody hens, while attempting to break them up. It should be kept in mind that the sooner a broody hen goes back into laying condition, the more quickly will the broody spell be broken. Consequently, broody hens should be fed the same ration as the laying flock and given all the mash that they care to eat. It is even advisable to feed them a moist mash once or twice daily. If broody hens are not fed a laying ration while being broken up, it will take them several days longer to get back into laying condition, after the broody spell is broken.

PURCHASING THE FEED SUPPLIES

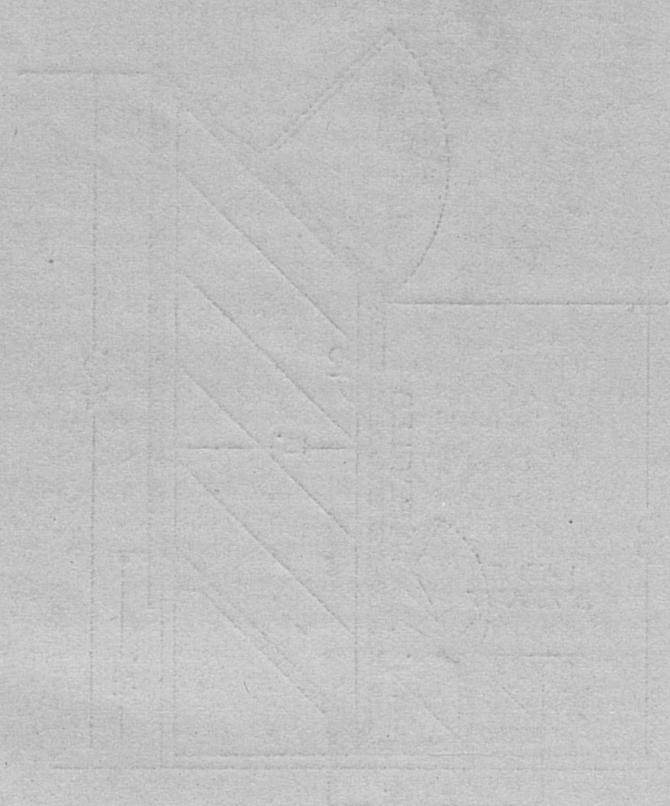
It is frequently advisable to purchase feed materials such as tankage or mill feeds in rather large quantities and at certain seasons of the year when they can be bought more cheaply. It pays to study the fluctuations of the markets and to price materials from various firms, as a saving in the purchase of a year's feed supply may mean as much profit as a considerable increase in production would return. The tables which give the approximate feed consumption of different breeds make it possible to easily compute the yearly requirements of a flock of any size. The poultry flock does not necessarily need the very best feed, yet none which is questionable as to quality or shows any signs of mold or must should be fed.



SECTIONAL END VIEW INDOOR SELF FEEDER

Figure 2.—This feeder may be built any length desired, in order that it may fit in some handy place, preferably on the side wall. Usually from 3 to 5 feet is the desired length.

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