How to Make 45% More On Your Hogs!

Table of Contents

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Hogs the Money Makers

Hog raising has made more clear money for farmers than any other enterprise. It is truly termed the mortgage raiser and has done more to make possible the securing of many of the luxuries the American Farmer enjoys today.

Not only has the big return made possible the numerous improvements on the farm, but in hundreds of cases it has made it possible for the farm boys and girls to go to colleges.

The wide-spread interest in hog raising is so intense and the profit so great that pig raising clubs have been organized all over the country and many philanthropic people are encouraging the boys and girls to raise them by advancing them the money to get a start.

The stories of their success have been eye openers to even the experienced hog raiser.

In the corn belt hogs furnish one of the most important means of marketing the crop and in territories where corn is not so abundantly raised, the hog is a means of giving the farmer a profit even in years of crop failures.

So universally is the hog considered a money maker that many farmers make hog raising their main business and have become independently wealthy.

We know of one man, inexperienced in hog raising who made a study of them and who in a few short years was able to pay off an indebtedness of over five thousand dollars and have a snug balance of several thousand dollars.

With all of these facts, it is still hard for many farmers to get rid of the notion that anything is good enough for the hog.

Yet the hog by nature is a cleanly animal and if given a chance will be the cleanest animal on the farm.

Hogs give the quickest money return of any livestock on the farm. They are more numerous than other farm animals. The year book of the Department of Agriculture gives the number of hogs on farms in the United States January 1st, 1918 as over 71 million. A recent Government report places the 1919 number at 75½ million with a farm value of 1 2/3

billions of dollars. It is only a matter of 6 to 8 months from birth to marketing. An average gain of 1¼ pounds a day during this time is not uncommon.

This rapid growth and quick turnover cannot be accomplished without proper care. Pigs farrowed late in the season, and not properly housed lose the fat they gain before weening time, and it is necessary to carry them into the winter before marketing. The result of this common method of handling the pig is that there is a big supply on the market at certain seasons, and as a consequence a lowering in price.

A study of the hog market will show on an average, the high points of the year. If hogs are marketed in (name months) the chances are in favor of a better price. The following prices are figured from the year book of the Department of Agriculture, and represent the average high prices on the Chicago market during the seven years from 1908 to 1914, before the market was affected by war conditions:

January	$7.40	July	$8.57
February	$7.68	August	$8.80
March	$8.37	Sept.	$8.97
April	$8.39	October	$8.51
May	$7.90	November	$7.87
June	$8.10	December	$7.62

It will be seen from the above chart that the prices for August and September range considerably higher than the other months, with September the highest mark for those years.

Proper Housing Pays Big Profits

On the average, the hog house is the poorest building on the farm and the least adapted to the purpose for which it was intended.

Many houses which cost enough to be good are thoroughly unfit for the purpose. Data published after exhaustive research shows that the good hog men average seven pigs to the litter and many surpass this record. This same data indicates that the general average raised on the farm does not exceed four pigs to the litter. This wide difference is mainly due to the housing. Consequently the average lose over 42% of their litters. Quite an item when one stops to consider it.

On far too many farms the hog house is just an old shack of a place, without windows, ventilation, or even a tight roof and walls. And ofttimes one of the owners who has such a building will remark "I never seem to have any luck with hogs."

Sometime ago we found a hog house that is so much an example of what it ought **not** to be that we like to keep a description of it in mind, to help others avoid the same mistakes. The first thing we noticed about this

house was the muddy yard around it. Some ear corn lay in the mud, so caked over that we wondered if the hogs could find it. Of course the hogs tracked the mud into the house, causing it to be damp and ill smelling. There were no windows; only a few doors. No ventilation, and no cement floor.

The losses in this barn were always heavy. A few pigs always died shortly after birth. The sows always laid on a few and crushed them, some usually took cold, and later died. It is safe to say that in a good house—designed for comfort and safety; with a good floor; plenty of sunlight and fresh air—several more pigs could have been saved each year. One farmer this spring reported saving every pig out of 80 farrowed.

Inefficient in sunlight and ventilation which causes big losses.

If we consider the advantages of having the right kind of quarters for the hogs we find; first, that the pigs can be farrowed at a time when they can be given careful attention; second, pigs in a good house can be kept growing from birth; third, that pigs can be sent to market at times of best prices; fourth, more pigs will be saved; and fifth, feed and labor will be saved.

Early pigs, raised in properly built, and **sunlit** houses get to market when the prices are best. Besides getting the pigs to market at the best time, there is another big advantage in early pigs. The farmer is a busy man from the time the oats are sown, until after harvest. Pigs farrowed at this time get very little and irregular attention, on the average. As a result the little pigs do not get the right kind of a start.

March 1st brings the pigs at a time when the field work is not so pressing. The little fellows get more attention until such time as they are able to shift for themselves, and are growing in good shape. But March 1st pigs are not to be considered unless there is a good house for them.

Nearly every large hog house is deficient in sunlight or ventilation, or in both. These are the big important features in the hog house. So important are they that the U. S. Department of Agriculture and Experimental Stations all over the U. S. have made a careful study of them and have issued numerous bulletins on these features.

Consequently it is our purpose to not only discuss these features fully and completely but to discuss other features that have a tremendous bearing on the profitable raising of hogs.

In the 14 points listed as essential features of an ideal hog house by the Iowa Experimental Station, six of them partly or entirely depend upon sunlight and ventilation.

These six points are:

1. Warmth: "Reasonably warm shelter, in season with least range of temperature is demanded by the swine."
2. Dryness: "A dry, well drained floor, and dry, tight roof and walls are quite essential."

Illustrating a practical and up to date hog house.

3. Abundance of light and direct sunlight: "Direct sunlight should sometime strike every part of the interior of the house daily, especially the floors of the pens in the special farrowing months of February, March and April."
4. Ventilation: "An abundance of fresh, pure air of satisfactory humidity, provided without draft is demanded."
5. Sanitation: "The cleaning and disinfecting of the hog house is imperative."
6. Safety and comfort.

Of course some of the above essentials are provided for in part by other items. It is certain, however, that a hog house without windows and provision for ventilation would be lacking in most of these essentials.

In a committee report made to the American Society of Agricultural Engineers a couple of years ago, this statement appeared: "For hog houses the design depends upon the size of the herd. Special emphasis is given to sanitary designs, plenty of light and provision for good ventilation."

Sunlight—the Natural Disinfectant

One of the first requisites for success with hogs is a shelter where young pigs can be kept warm and well supplied with sunshine and fresh air. Direct sunlight gives suckling pigs vigor and strength. A little pig takes cold very easily and recovers slowly, if at all. To prevent taking cold he must be kept warm, away from drafts and provided with fresh air.

Without sunlight we cannot have profitable swine husbandry. It is the great and universal germ destroyer and kills disease-causing organisms. It promotes dryness, warmth and ventilation, thus bettering hygenic conditions. Direct sunlight should strike each part of the interior of the house at some time during the day; and the pens should be well sunned, especially in the farrowing months of February, March and April. The forenoon sun has unusual value, coming as it does immediately after a relatively long, dark, and ofttimes cool and damp night, so weakening to young and suckling pigs. A little pig loves sunshine and needs it almost as much as he needs food.

In talking with hog men over the middle west it is evident that sunlight is beginning to be considered as one of the essential things to provide, in the hog house. These statements will show this trend of thought. One says "My sunlight hog house enabled me to save 50 pigs I would have lost otherwise. My sows farrowed the last of February and under the old conditions I believe I could not have saved them."

Another man says "I believe I saved 35 pigs due to the warm, modern building."

"My estimate is 20 per cent more pigs saved", said a third farmer.

"In the next house I build," one Iowa hog man said, "I will put in another row of windows. The house is giving good satisfaction but my mistake was in having too few windows."

One thing most important is the correct location of windows, as shown by the statement made by one builder, who said, "My house has lots of sunlight, but the light shines on the pens most efficiently in April, while I want the pigs to farrow in early March."

In the following discussion it is our purpose to discuss not only the standardized types of houses but their location as well as the location of the windows in these various types of houses, and for various localities in the middle west, so the builder may provide a sufficient amount of light, when and where it is most needed.

Standardized Types of Houses and How to Locate Them

Our principle concern, however, is with the so-called community Hog Houses. Of these, there are two general types, so far as lighting is concerned.

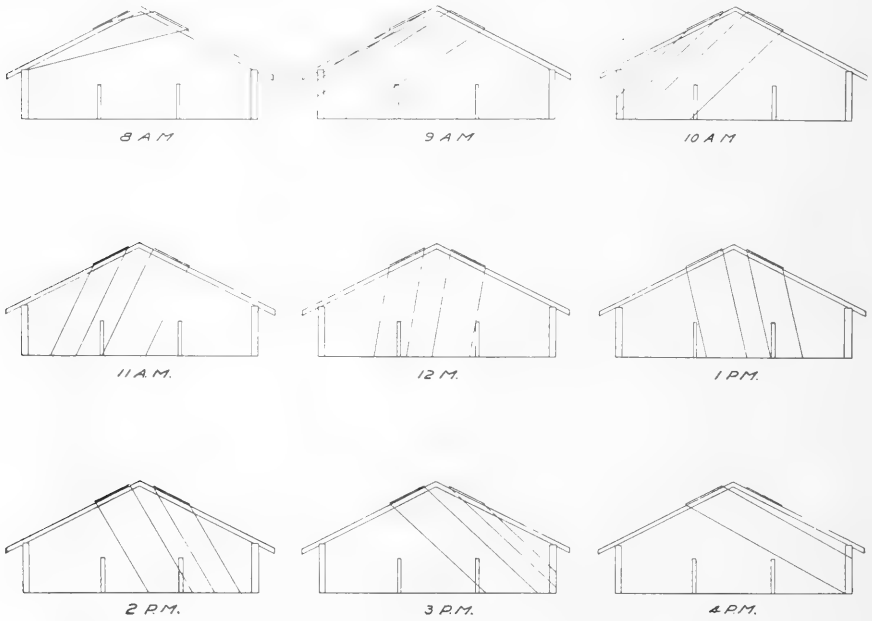


Fig. 1—Relative position of sunlight at different hours March 10, in Iowa Sunlit Hog House for Central Iowa, 42° N. Latitude—Marshalltown, Ames and Carroll, Iowa.

North and South Houses These are the houses which set with the long way north and south. In this type the direct sunlight is secured on the east roof and walls in the morning, and on the west side in the afternoon. The second general type with the ridge east and west, and faces the south.

In the first type of house, which we will call the "north and south" hog house, the sun shines into the building the greater part of the day. In January and February there will be but five or six hours of sunlight on the floor of the house. Later in the year, when the days are long, there will be several more hours of sunshine in the building. Figure 1 shows the direction of the sun's rays at Ames, Iowa, March 10, 1915.

Latitude, within reasonable limits does not materially affect the length of time the sun shines into the house. Time of the season affects the length of time of direct sunshine only as the days are longer or shorter. It does not make much difference when the pigs are farrowed, they have sunlight on the pens several hours a day.

On point must be observed in locating the windows in the north and south type. If the windows are placed low in the wall or roof the sun will be thrown directly on the pens early in the day. The higher the windows, the later in the day the light strikes the floor. See Fig. 1. In either case any given part of the floor is touched by the sunlight for the same length of time.

A reasonably low window, however, fits in well with the best ideas of hog house construction. Figures 2, 3 and 4 show the common dimensions for location of the windows in the more widely used types.

"Iowa Sunlit" House The first of this group, Fig. 2, is commonly called the "Iowa Sunlit" hog house. It was developed by the Iowa Experiment Station at Ames, who have a bulletin and blue print plans describing the construction in detail. (This and blue prints of other designs are furnished free of cost and without obligation by the Phillip Bernard Company). This house is widely used in the hog belt and has given general satisfaction. The windows are in a continuous row on each side of the roof. Direct rays of the sun strike the west row of pens in the morning and the east row in the afternoon. Sidewall windows in the south wall light the end pens which are not reached by the roof windows.

Sometimes the Iowa Sunlit, or gable roof house is modified as shown in Figure 3, giving two rows of windows in each slope of roof. This type is also quite widely used. The lower row affords sunlight early in the morning and the upper row later in the forenoon.

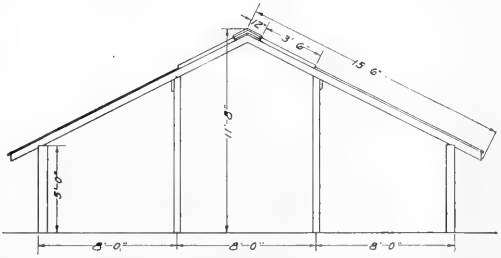


Fig. 2—Position of skylight window row in Iowa Sunlit Hog House. House with drive.

"Nebraska Type House" Figure 4, or the "Nebraska Type" House was designed to meet the needs of the farmers of that state. The Nebraska type is higher than the others having room for storage of feed and bedding overhead. All of the light is furnished by sidewall windows. Such a construction requires walls higher than the types using roof windows. In this house, the light falls on the east pens in the morning, and the west row in the afternoon.

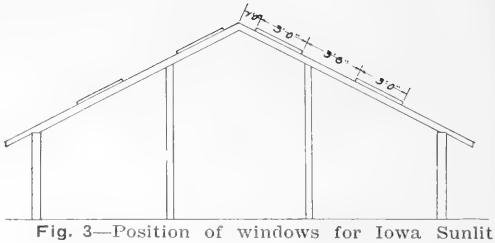


Fig. 3—Position of windows for Iowa Sunlit Hog House when two rows or saggered windows are wanted.

East and West House The hog houses which set with the long way east and west, with the front to the south, for light are more numerous than the other types.

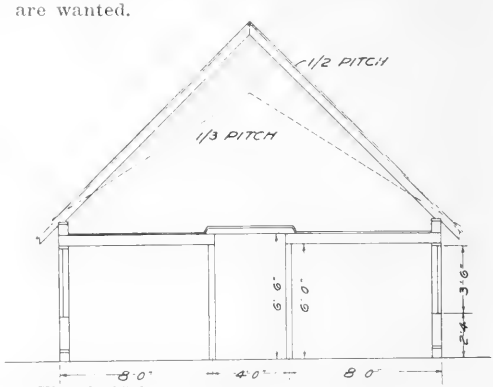


Fig. 4—Nebraska Type Hog House, set North and South.

In the Iowa Type house it was not necessary to locate the windows for a particular time and place. But the all important thing in the east and west house is the correct location of the windows, for we want sunlight in the pens when the farrowing season comes. A little study of the following paragraphs will show the need of careful planning.

About Dec. 22, when our real winter season begins, the sun is at its southern point—the angle of the sun is low. On a winter's day at noon a man's shadow is quite long, and falls directly to the north.

As the winter proceeds the sun appears to swing back, over the Equator in latter March, and June 22 or thereabout, the sun is at the northern point. Then one's shadow is short, at noon time. Fig. 5 shows the angle of the sun's rays at 42½° North Latitude from Jan. 1 to May 1.

So if we wanted a hog house properly lighted for February 1st farrowing, the window would be set low in the wall to catch the rays of the sun at the angle shown in the drawing. But for May 1 pigs, the sun shines more nearly straight down, so the window would have to be higher.

If it were possible to have a window that could be adjusted up and down, the problem would be solved very nicely. Starting with the opening near the ground in February it could be raised as required, to always throw light in the nesting place. But this of course is impractical. It will be necessary therefore to decide upon the time of farrowing, and plan accordingly.

But there is another item that enters into correct location of windows. Fig. 12 shows the angle of the sun's rays at 42° N. Latitude. At the time the sun's rays strike at this angle at Boone, Iowa, the sun will appear lower

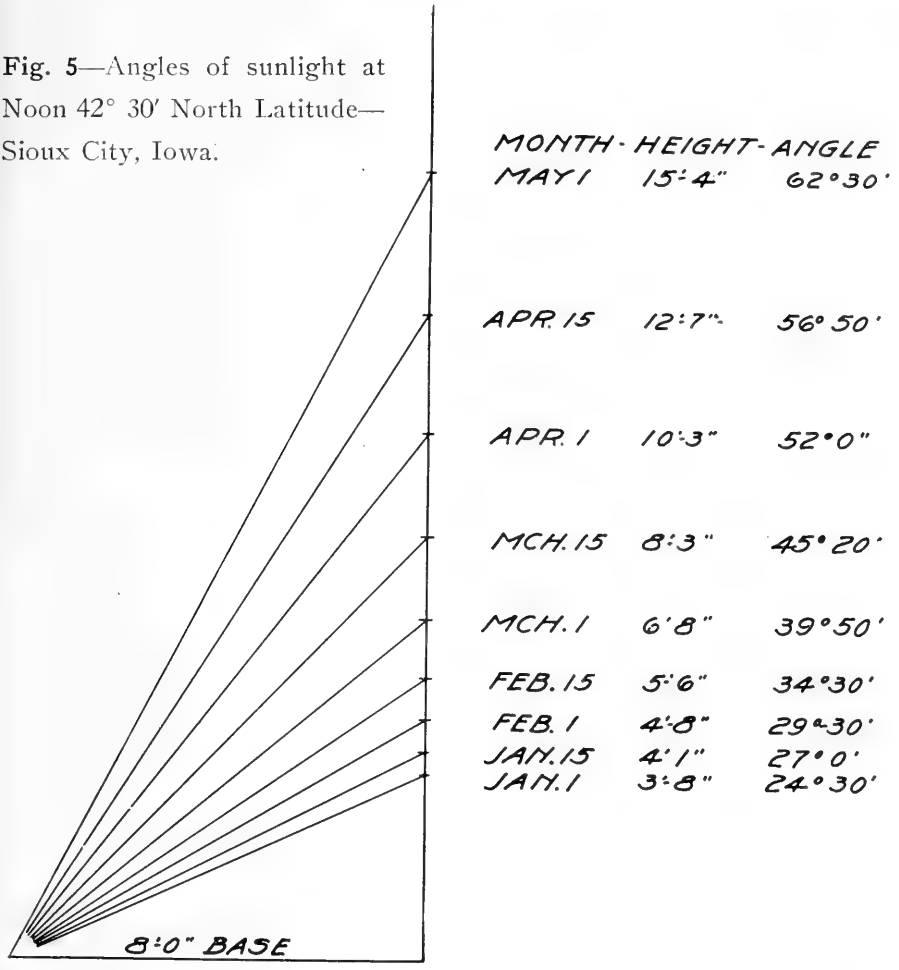


Fig. 5—Angles of sunlight at Noon 42° 30′ North Latitude—Sioux City, Iowa.

in the south from Duluth, Minn.; and more nearly overhead from Atlanta, Ga. So the house designed for Minnesota would not be satisfactory, at the same time for Georgia conditions.

If the reader will refer to the map, Fig. 6 and determine his approximate latitude, and knowing the average date of farrowing, he will be in a position to determine the correct location of the windows. In the drawings on the pages that follow are shown several different styles of houses such as are widely used by corn-belt farmers. These drawings are not intended as working plans of the buildings, but as an aid to the builder in properly

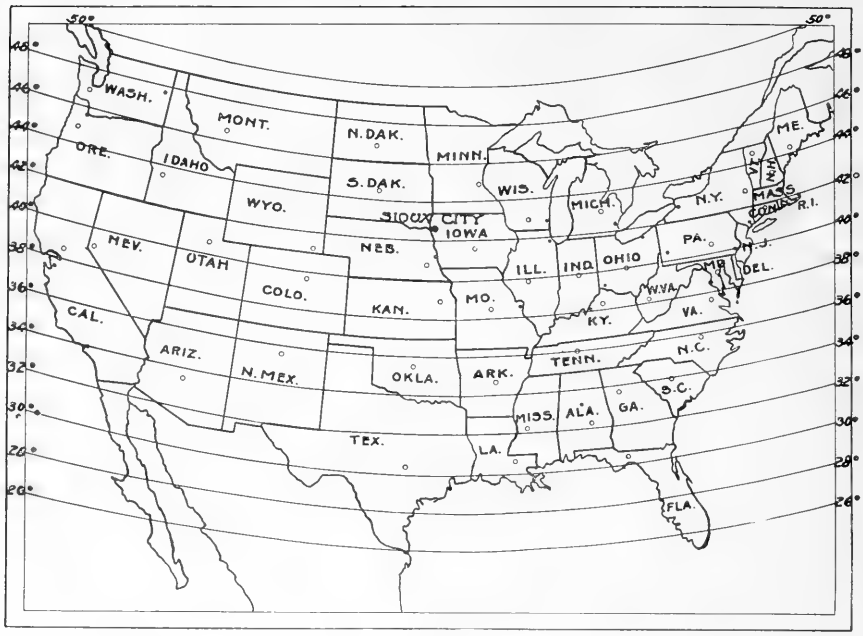


Fig. 6.

locating windows, to avoid some of the common mistakes. In order that the most common problems may be solved uniformly, we have assumed a ¼ pitch roof, 8 foot pens, 4 foot alleys, 8 foot driveways, and side walls usually 5 and 6 feet in height.

"Shed" Roof House

Fig. 7 shows the correct location of windows for Feb. 1 to March 1 farrowing in a shed roof hog house at about 42½° North Latitude, or on a line with Waterloo, Iowa. Since the angle of the sun's rays is small, the building need not be high. For a four foot alley, and 8 foot pen, the window height would be 7 feet 0 inches. After March 1st the sun is higher overhead, and the light would no longer strike the pens to best advantage.

For later farrowing, then the windows will have to be placed higher. In the shed roof house it means a higher building. Fig. 8 shows windows 9 feet 8 inches high which throws the light to the rear of the pens in this building March 1. Light will be thrown in this pen until April 1. If the farrowing time comes later than April 1, it would be better

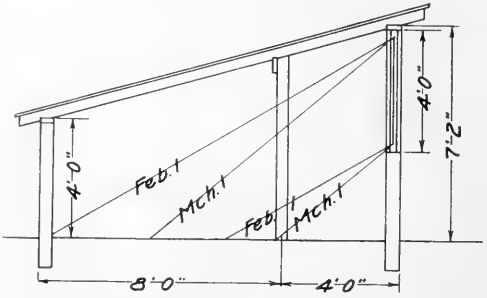


Fig. 7—Position of sun's rays for February 42½° N. Latitude—Waterloo, Iowa.

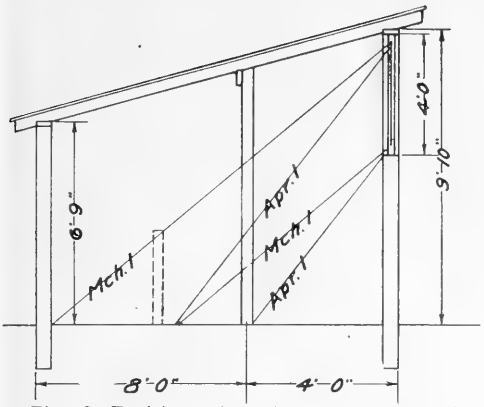


Fig. 8—Position of sun's rays for March, 42° 30′ N. Latitude—Dubuque, Iowa.

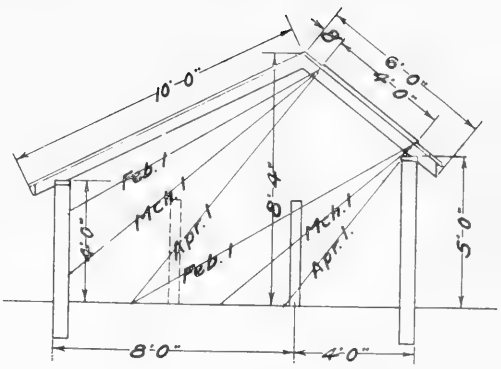


Fig. 9—Position of sunlight February 1 to April 1, 42°, 30′ N. Latitude—Sioux City, Iowa.

to change the pen arrangement to throw the feed alley to the rear of the house, and put the 8 foot pens in front, or lower the window.

"Combination" Roof Hog House

Figure 9 shows the common dimensions for the "Combination" roof hog house. The object of this type is to secure a lower building, by placing the windows in the roof instead of the sidewalls. This house is 12 feet wide, and the location of the windows shown for 42½° North Latitude. For farrowing from Feb. 1 to April 1 the feed alley should be along the south. Later than this, the partition should be in the position indicated by the dotted line and the back wall made higher.

"Sawtooth" Type In this type of house there are two rows of windows, one in the front part near the ground to light the front row of pens and another row in the upper part of the wall to throw light at the back of the house. One of the common mistakes is to have these two window rows so arranged that they are not both efficient at the same time. Our meaning may be made more clear by referring to Fig. 10 and 11 in the first illustration the lower row is efficient for February farrowing, while the top row does not begin to light the pens to best advantage until March 1st. The second figure shows a more "aggravated" case. Here the upper windows are too high, and the other row too low for March 1st sunlight.

The half monitor, or "sawtooth" type in Fig. 12 shows two rows of pens each 8 feet wide, and the angle of the sun's rays is given, showing the correct location for March to April farrowing. This is for 42° North Latitude, or about on a line through Ames, Iowa. Fig. 13 shows the same kind of house but with an 8 foot driveway. Under the same conditions as above, the upper windows would have to be higher in order to throw the light at

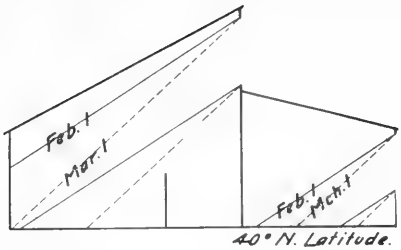


Fig. 10.

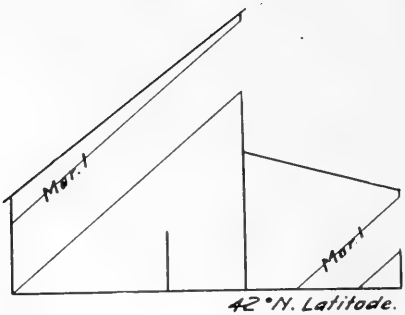


Fig. 11.

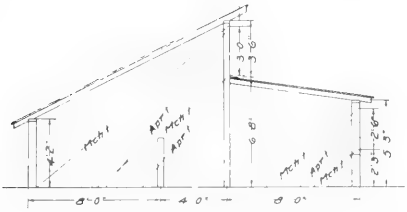


Fig. 12—Position of sun's rays for Mar., 42° N. Latitude—Ames, Iowa.

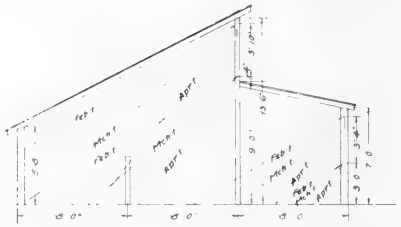


Fig. 13—Position of sun's rays from Feb. 1 to April 1, 42° N. Latitude—Cedar Rapids, Iowa.

the back of the north pens, since the driveway makes the distance greater from the line of the windows to the north wall.

"Semi Iowa" or "Dakota" Type

Fig. 14 shows the application of the sunlight problem to the gable roof house which runs east and west. This is sometimes called the "Semi-Iowa" type, or "Dakota" hog house. The dimensions given are commonly used and make efficient lighting. In some houses of this sort both rows of windows are placed in the south slope of the roof, one row near the ridge, and the other just above the plate. In the figures here shown, it will be noted that it is necessary to make the south wall higher, in order to bring direct sunlight on the front pens. The rays here shown are for 41° North, or a line with Fairfield, Iowa.

Fig. 15 shows an application of the same problem to a house with driveway through the center. Since the building is wider, it is necessary to place the windows higher in the roof to secure light on the north pen. Fig. 16 shows windows for 43° N., in the same type of house except the roof is of the gable type, and both walls the same height. Fig. 17 illustrates the gable roof houses with narrow alley at 43° North, showing correct location of windows for March to April farrowing.

Individual Hog House

Some attention must be given to the individual type of hog house. This house is economical, handy, easily moved, and a good one for the beginner.

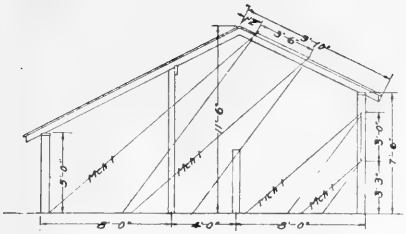


Fig. 14—Position of sun's rays for month of March, 41° North Latitude—Fairfield, Iowa.

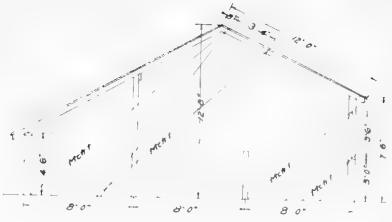


Fig. 15—Position of sun's rays for month of March, 41° North Latitude—Red Oak, Iowa—Galesburg, Ill.

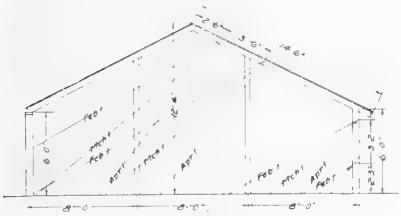


Fig. 16—Positions of sun's rays for months February and March, 43° North Latitude—Madison, Wisconsin.

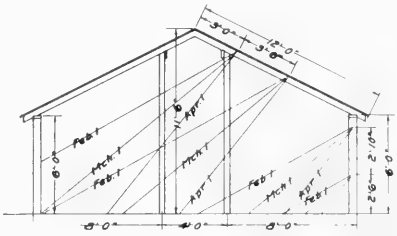


Fig. 17—Position of sun's rays February 1 to April 1, 43° North Latitude—Milwaukee, Wisconsin.

The tenant farmer likes this type of house because it is easily moved. On many farms the individual house serves to supplement the centralized house. The individual house is low in cost

The chief disadvantages of this type of house are that it is not permanent and has wood parts in contact with the moist soil. The greatest trouble is the lack of light and ventilation. Ventilation is secured by opening at the ridge of the roof in the ends, and by open doors. The gable roof hog house has been arranged so that two window sash may be placed in the roof doorways and direct sunlight provided.

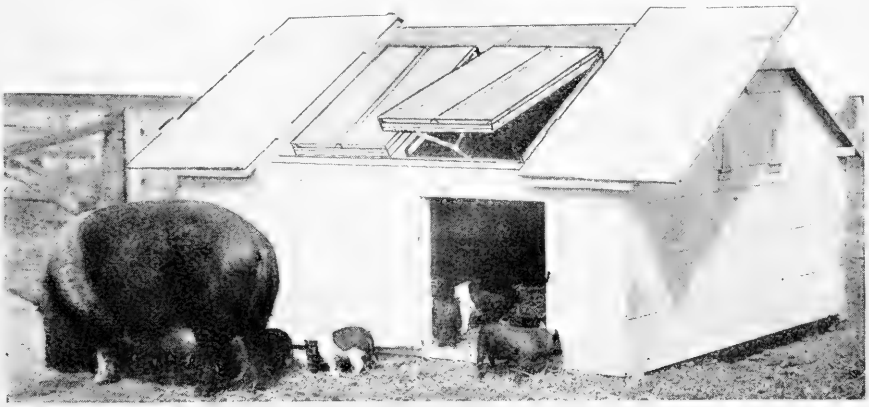


Fig. 18—Individual Hog House with Sunlite Windows.

Where and How to Locate Windows

"How can I get the correct location of windows in my own hog house?" is the question of greatest interest to every breeder.

It is our purpose to show in the following brief descriptions, some short methods of locating the windows in the hog house.

Possibly you are building a house very similar to one of the types previously mentioned, and it may be that the dimensions then given will suit your purposes.

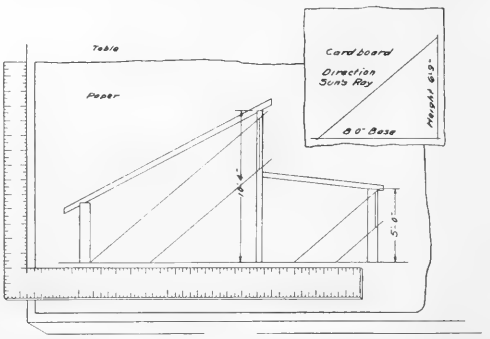
Locating Windows in Wall

It is possible by referring to these pages to figure out the sunlight for a special house no matter what the type.

On page 17 is a sunlight table from which it is possible to determine the angle of the sun's rays for a given latitude at any particular date. These figures are adapted from Farmer's bulletin 438, and are based upon accurate record of the Naval Observatory. In the table the black face figures show the observation for noon, and the lighter figures the data for 10 A.M. or 2 P.M. To avoid too many figures, all the readings have been reduced to a basis of the height necessary to throw light 8 feet back from the window line. In simplest terms, these readings show the height of the top of the window to throw light back a distance of 8 feet from the wall where the window is placed.

If it is desired to have the light back a distance of 12 feet from the wall instead of 8, it is only necessary to remember that the rays are parallel to each other, and if we determine one line, the others can be easily found. An illustration of this statement will show how to apply the table. Suppose your latitude is 42° N., and it is desired that the farrowing season begin March 1. Refer to the table, under the column headed "March 1." Follow down this column until you come to 42°. The figure for noon is 6 feet 9 inches. Now cut a triangle from a cardboard 8 inches along the bottom and a height of 6¾ inches. The straight line between the two points—the hypotenuse or slant height of the triangle will be the direction of the sun's rays.

Next place a sheet of paper on a smooth table, and fasten it down. Place a steel square along the edge of the table and draw a



No. 19—Method of locating position of windows in wall, March 1, 42° North Latitude.

Sunlight Table

North Latitude	HEIGHT OF WINDOWS IN ORDER THAT SUNLIGHT FALL 8′-0″ IN FROM WALL								
	JANUARY		FEBRUARY		MARCH		APRIL		MAY
	1	15	1	15	1	15	1	15	1
34°	**5′-2″**	**5′-8″**	**6′-5″**	**7′-6″**	**9′-0″**	**11′-3″**	**14′-1″**	**18′-1″**	**23′-2″**
	4′-7″	5′-2″	5′-11″	6′-11″	8′-7″	11′-0″	14′-6″	19′-7″	26′-5″
35°	**5′-0″**	**5′-6″**	**6′-2½″**	**7′-7½″**	**8′-8″**	**10′-9½″**	**13′-6½″**	**17′-4″**	**22′-0″**
	4′-4½″	4′-11″	5′-8½″	6′-8″	8′-3½″	10′-7½″	13′-11″	18′-8″	24′-11½″
36°	**4′-10″**	**5′-4″**	**6′-0″**	**6′-11″**	**8′-4″**	**10′-4″**	**13′-0″**	**16′-7″**	**20′-10″**
	4′-2″	4′-8″	5′-6″	6′-5″	8′-0″	10′-3″	13′-4″	17′-9″	23′-6″
37°	**4′-7½″**	**5′-1½″**	**5′-9½″**	**6′-8″**	**8′-1″**	**9′-11½″**	**12′-6″**	**15′-10½″**	**19′-10″**
	4′-0″	4′-6″	5′-3½″	6′-2½″	7′-9″	9′-10½″	12′-10″	17′-½″	22′-3″
38°	**4′-5″**	**4′-11″**	**5′-7″**	**6′-5″**	**7′-10″**	**9′-7″**	**12′-0″**	**15′-2″**	**18′-10″**
	3′-10″	4′-4″	5′-1″	6′-0″	7′-6″	9′-6″	12′-4″	16′-4″	21′-0″
39°	**4′-3″**	**4′-9″**	**5′-4½″**	**6′-2½″**	**7′-6½″**	**9′-4″**	**11′-7″**	**14′-6½″**	**17′-11½″**
	3′-8″	4′-1½″	4′-10½″	5′-9½″	7′-3″	9′-2″	11′-11″	15′-8″	20′-0″
40°	**4′-1″**	**4′-7″**	**5′-2″**	**6′-0″**	**7′-3″**	**9′-1″**	**11′-2″**	**13′-11″**	**17′-1″**
	3′-6″	3′-11″	4′-8″	5′-7″	7′-0″	8′-10″	11′-6″	15′-0″	19′-0″
41°	**3′-11″**	**4′-4½″**	**4′-11½″**	**5′-9½″**	**7′-0″**	**8′-9″**	**10′-9½″**	**13′-5½″**	**16′-4½″**
	3′-4″	3′-9½″	4′-6″	5′-4½″	6′-9″	8′-7½″	11′-1″	14′-4″	18′-1½″
42°	**3′-9″**	**4′-2″**	**4′-9″**	**5′-7″**	**6′-9″**	**8′-5″**	**10′-5″**	**12′-10″**	**15′-8″**
	3′-2″	3′-8″	4′-4″	5′-2″	6′-6″	8′-3″	10′-8″	13′-8″	17′-3″
43°	**3′-7″**	**4′-0″**	**4′-7″**	**5′-5″**	**6′-6½″**	**8′-1½″**	**10′-½″**	**12′-4″**	**15′-½″**
	3′-0½″	3′-6″	4′-2″	5′-0″	6′-3½″	8′-0″	10′-3½″	13′-2″	16′-6½″
44°	**3′-5″**	**3′-10″**	**4′-5″**	**5′-3″**	**6′-4″**	**7′-10″**	**9′-8″**	**11′-10″**	**14′-5″**
	2′-11″	3′-4″	4′-0″	4′-10″	6′-1″	7′-9″	9′-11″	12′-8″	15′-10″
45°	**3′-3″**	**3′-7½″**	**4′-2½″**	**5′-0″**	**6′-6″**	**7′-6½″**	**9′-4″**	**11′-5½″**	**13′-10½″**
	2′-9″	3′-1½″	3′-9½″	4′-7½″	5′-10½″	7′-5½″	9′-7″	12′-2″	15′-2″
46°	**3′-1″**	**3′-5″**	**4′-0″**	**4′-9″**	**5′-10″**	**7′-3″**	**9′-0″**	**11′-1″**	**13′-4″**
	2′-7″	2′-11″	3′-7″	4′-5″	5′-8″	7′-2″	9′-3″	11′-8″	14′-6″
47°	**2′-11″**	**3′-3″**	**3′-10″**	**4′-7″**	**5′-7½″**	**7′-½″**	**8′-9½″**	**10′-8½″**	**12′-10″**
	2′-5″	2′-8½″	3′-5″	4′-3″	5′-5½″	6′-11″	8′-11″	11′-2½″	13′-11½″
48°	**2′-9″**	**3′-1″**	**3′-8″**	**4′-5″**	**5′-5″**	**6′-10″**	**8′-5″**	**10′-4″**	**12′-4″**
	2′-3″	2′-6″	3′-3″	4′-1″	5′-3″	6′-8″	8′-7″	10′-9″	13′-5″

Note: **Bold face figures for 12 M (Noon). Top line each degree.**
Light face figures for 10 A. M. or 2 P. M. Bottom line each degree.

horizontal line, as shown, also a vertical line. Place the triangle on the edge of the steel square, and draw thru the 12-inch mark, extending the diagonal line until it cuts the vertical line. With the rule find the length of the vertical leg of this new triangle. The measured inch will be the height in feet the top of the window should be in the wall to throw light 12 feet back of the window line. See Fig. 19. A careful study of the above will enable any contractor, lumber dealer, or farmer to figure the height of window for the hog houses he is interested in.

In a similar way it is possible to plan for different dates, different latitudes, and various widths of houses. If the reader has determined upon the style of house, he may locate the windows by the following method:

Square up a sketch of the hog house on a table, by means of a square, cut the triangle as before, and place it over the sketch. Since the diagonal, or hypotenuse is parallel to the sun's rays, it is only necessary to set this hypotenuse on a point in the floor line the light is desired and the point where the line cuts the wall is the correct place for the window.

Method of Locating Position of Window in Roof

East and West Hog Houses

The previous discussion refers especially to location of windows in the sidewalls. In many of the houses roof windows are necessary and the following discussion offers a convenient method of locating them.

All breeders and feeders want the sunlight in the greatest amount at farrowing time. In many cases the roof windows are not located for farrowing time selected with the result that, the window is either too high or too low and experience would determine the exact location. Since most breeders cannot waste a season in experimenting, the following simple method of locating the exact position of windows for the selected farrowing time is given.

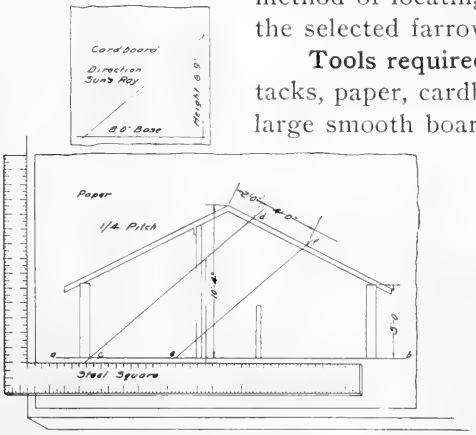


Fig. 20—Method of Locating position of Roof Windows for East and West Hog House.

Tools required: Steel square or Tee square, small tacks, paper, cardboard, pencil, knife, and table top or large smooth board.

Operations:

1. Secure large piece of paper to board or table top with small tacks.

2. Make triangle from cardboard. Determine your latitude and farrowing season. Lay off 8 inch base line and draw an upright line at end, 'square' with base line. From table Page 17 determine height of window for

your latitude and farrowing season. Measure length on upright line. Use one inch to represent one foot, for example, March 1 farrowing season and 42° N. Latitude 6 feet 9 inches is found for height of window. Measure 6¾ inches. Connect ends of two lines and cut out with sharp knife.

3. Place square on table as shown and draw line ab. Figure 20.

4. Now set triangle base line against upper edge of steel square and draw line cd. This is the direction of the sun's rays at noon March 1, 42° N. Latitude.

5. Now draw section of hog house wanted so line cd comes to the inside of edge of pen as shown. Make walls desired heighth and place rafters at required pitch.

6. Sun's ray will cut rafter in d. Measure to ridge and set figure found 2 feet in Fig. shown.

7. Now measure length of window downward from d on rafter and draw line of parallel to cd.

8. Line cd will be sunlight position in pen.

The curve Fig. 21, is derived from the table and instead of referring to the table, the reader can refer to the curve in the following manner. From the farrowing date at the bottom, follow the line upward until it strikes the curve of your latitude. From this point follow the horizontal line, and read

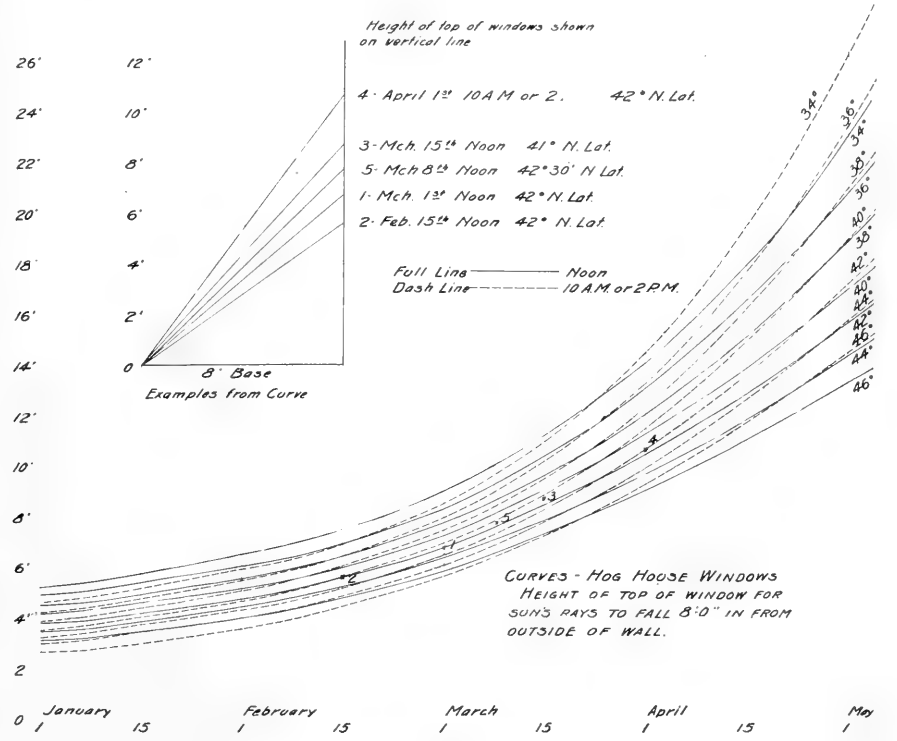


Figure 21.

the height of window. For example select March 1, follow up to the heavy line to "1" and then across to the scale at the side and 6 feet 9 inches can be read, which agrees with the table. In this case the triangle would again be cut 8 inches by 6¾ inches, and the hypotenuse would show the angle of the sun's rays.

Sizes and Kinds of Windows

While there is no set rule as to the exact sizes of windows to be used, —a very common and popular type is one holding two lights, each 10 by 28 inches, making an effective glass area of 20 by 28 inches. Any change from this size should be for a larger rather than a smaller window. In every window there is a certain amount of sunlight that is cut off by the necessary framing. The larger the window, the less per-cent glass area is lost by this method. Single or double strength **plain glass** is best: it admits the maximum amount of light, with the least reflection. Prism glass, or opaque glass, such as is used in stores and factories to spread the light, and do away with direct rays, **should not be used.** It is the sanitary effect of direct sunlight that is wanted in particular in the hog house. For the same reason colored glass is not desirable.

In roof windows there has been the objection that hail would break the lights. It is improbable that the item of breakage would be large. (In our hog house, with 32 windows not a single light was broken during the severe hail in early June, 1918). To protect them from the possibility however, roof windows may be purchased with a wire mesh screen over the glass, which prevents breakage. This is of greater importance in sections visited by hail frequently. If, however, the wire mesh is not desired, it can be very easily removed.

During the warmer times of the year, there is an objection to too much sunlight in the house, because of the heat. A hog needs shade in summer as well as sunlight in early spring, and fall. Too much sunlight may be avoided by covering the windows inside with a wooden shutter, or heavy cloth. Some men have solved the problem by placing a few boards on the tie plates and covering them with straw.

Whether roof or sidewall windows are used a portion of them should be arranged to open partially, for ventilation in warm weather. In mild winter weather, or spring days, several of the windows may be opened to allow a good circulation of air. Sometimes a large number of feeder hogs will be kept in the house, and window ventilation is needed to assist the regular ventilation system in removing the moisture laden, foul air. (There is a patented ventilating window on the market that is manufactured for just this purpose.)

For best efficiency of sunlight in the house, pens made from heavy wire fencing, or built up iron panels are gradually replacing wood pens. It is

probably a matter of only a few years until the wood panels will not be used in the better hog houses. Hog men are realizing that they cannot afford to lose the direct sunlight.

Ventilation

Ventilation of hog houses is a subject for study, and practice. Perfection has not been reached. The objects of ventilation are well known, and the benefits derived are worth the cost.

The objects of ventilation are to bring fresh air into the building, and to remove breathed air with its impurities, maintaining the air at a healthful standard of purity.

The vital element in pure air is oxygen. This element which composes about 23 per cent of pure air is necessary to sustain life. If oxygen is taken away from a man or an animal altogether he will live but a few minutes. If oxygen supplied, and with no ventilation, the hog will live. But without pure fresh air supplied in correct amounts, the animals will not make best gains. Besides bringing in fresh air, it is necessary to remove the foul air from the building. Air which has been once breathed loses more than 4 per cent of the oxygen, and increases by about the same percentage of carbon dioxide—which is injurious to life.

Carbon dioxide, called by chemists CO_2, is so powerful that in its full strength it will kill an animal very quickly. In a poorly ventilated barn it irritates the skin, and causes the animal to lose vitality and health. It occurs in pure country air in about 4 to 6 parts in 10,000. In barns it will often be found as high as 20 parts in 10,000 of air. Above this point the air becomes undesirable. In houses or churches air breathed a second time causes people to become sleepy and dull.

Another thing necessary in ventilation is to remove the moisture. Moisture is constantly being given off by the lungs and pores of the skin, in the form of vapor. This takes place thruout the year. We see it by the visible moisture of the breath on a frosty morning, or by the condensation when one breathes against a mirror.

A barn or hog house that is poorly ventilated will be steamy when the doors are opened on a cold morning. There is apt to be frost on the walls, and drops of moisture on the ceiling. Sometimes the skin of the animals will feel damp. This causes a great deal of trouble. Wood post and framing will rot and decay. Sometimes the moisture is so bad it is actually uncomfortable to work about the barn. Hogs are not protected with fur as other animals are, and if they go from a damp cold building, into the open air, colds result. Farmers have told us that their hogs have colds, contract pneumonia, and die.

These difficulties may be overcome by proper ventilation. Now it is easy to ventilate a barn by providing enough outside air. But if too much

fresh air is provided in the winter time, the building becomes cold. The correct ventilation for a barn or hog house means sufficient fresh air to supply the needs of the animals, and some means of regulation of the air flow to avoid too low a temperature.

According to the best authorities each full grown pig will breathe about 1100 cubic feet of air in 24 hours. This is 46 cubic feet every hour. If the air is kept in a state of purity, as recommended, it will be necessary to provide fresh air in much greater amounts than is actually breathed by the animal. For a hog, it is necessary to provide 1380 cubic feet of fresh air every hour or 23 cubic feet per minute.

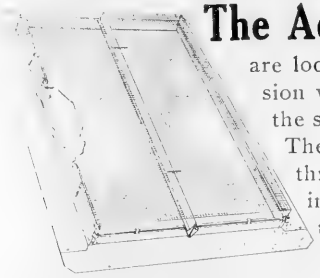
It is considered that an animal should not be forced to re-breathe more than 3.3 per cent of air. In other words 96.7 per cent of air in each breath must be fresh. This is the reason so much more air must be supplied than is actually breathed.

To provide this ventilation a definite system of air flues, or ventilating windows, and cupolas must be provided. Good buildings are warm and tight. Some air will leak in around cracks and poorly fitted doors, but not at the right time nor in sufficient quantities. The "common system" of ventilation which provides ventilation only by this leakage, and a cupola at the ridge, without means of regulation is to be discouraged. It is "common" only because hog men have not realized the necessity of a well defined and well regulated system, which can easily be obtained by the use of ventilating windows and cupolas.

The most important item in a ventilating system is a good cupola on the ridge. Metal cupolas are built in a scientific manner for best outflow of air, and to protect the flues from the entrance of rain and snow, and birds. A metal ventilator sets off a building in better shape than the wooden ones, and cost but little if any more. Also the expense of painting and repairing is done away with.

For intakes the ventilating window which can be raised to any desired heighth from inside the building, furnishes an excellent means of supplying fresh air without drafts.

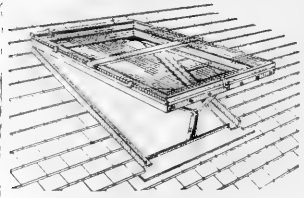
No. 1 consists of a galvanized iron frame with a 4-inch flashing on the sides and bottom and a 5-inch flashing at the top. Outside dimensions 28 inches wide and 37 inches long. The 5-inch flashing at the top allows it to extend under the second row of shingles, insuring an absolutely water-tight construction.



The Adjustable Frame

As shown by the illustration, the side bars are loose from the flashing. The flashing has an extension which provides a seat for the glass, and the top of the side bars are folded over to form a cap for the glass. The side bars are slotted to hold bolts which also pass through the extension of the flashing. By loosening the bolts the side bars may be raised to insert the glass from the bottom. The sidebars should then be pressed to the glass closely and the bolts tightened. This arrangement eliminates the necessity of removing the screen when taking out or putting in glass and further holds the glass absolutely rigid. No rattling or vibration.

PRICE, EACH ----------$2.50



Sun-Lite Window No. 2 (Ventilating Window)

Sun-Lite Window No. 2 varies somewhat in construction from the No. 1 model, the principal difference, however, being the arrangement for opening and closing the window from inside the building. This is indeed a very valuable feature. The window can be opened to any degree and fastened so that it can not even vibrate. The accompanying cut gives an excellent idea of the use of this window. The folding handle rests snugly against the wall when the window is closed.

The water drain consists of a trough which surrounds the entire frame. Glass can be inserted without removing the screen or any part of the frame. Simply turn back the clips and raise the center bar.

No. 2 Window does away with the need of cupolas or other ventilators on ordinary size Hog Houses. The draft can be regulated to the extent desired. Practical and economical.

PRICE, EACH ----------$3.75

All O. K. SUN-LITE Windows are built for the use of TWO LIGHTS, each 10x28 inches. The glass is covered by a heavy, fine mesh, galvanized screen, which almost entirely eliminates breakage. Screens can easily be removed. No PUTTY NEEDED.

O. K. SUN-LITE WINDOWS are sold without glass, on account of the great danger of breakage while in transit. The glass can be procured from your local dealer at a nominal cost.

The O. K. SUN-LITE WINDOWS are easily installed in old buildings. Simply remove enough shingles to allow placing the window on the rafters and then re-shingle over the flashing and the job is completed.

Full description and set of nine blue prints of Modern Hog Houses sent FREE.

SUNSHINE AND PURE AIR ARE PROFIT PRODUCERS

PHILLIP BERNARD CO., Mfgs., Sioux City, Iowa