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BURNING LIMESTONE FOR AGRICULTURAL USE.

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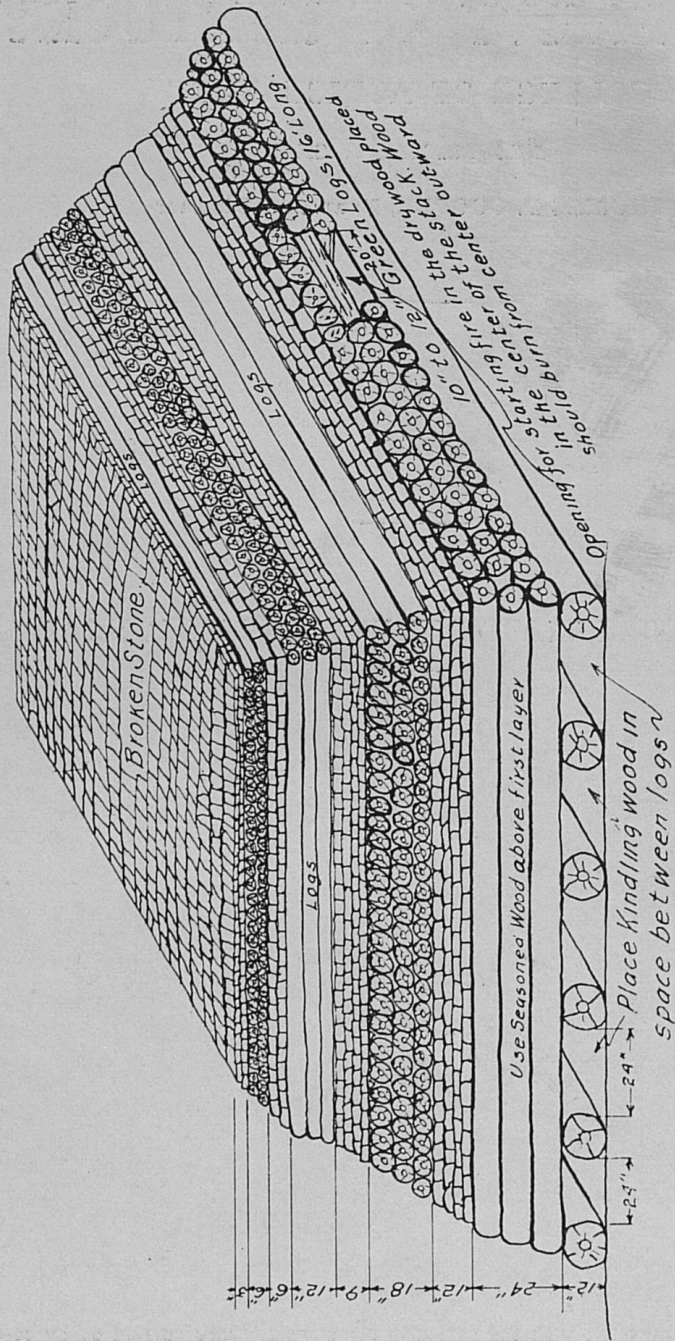


Fig. 1. A stack for burning limestone.

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Burning Limestone for Agricultural Use

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Extension Agricultural Engineer

Where wood is plentiful limestone may be burned as cheaply as it can be ground on the farm. This fact is shown by cost records. When 15 cents per hour is allowed for labor and \$1.00 per cord for wood, the cost of burning limestone does not exceed \$2.00 per ton. Limestone may be burned in a limekiln or in a lime stack. If only a few tons of lime are needed and logs 12 inches in diameter or larger are available, the lime stack is more satisfactory than the kiln. Where large logs cannot be obtained easily but a plentiful supply of small wood is available, the kiln should be used. When making an estimate of the amount of lime needed it should be kept in mind that one ton of fresh-burned lime is equivalent to two tons of ground limestone. Burned limestone weighs 66 pounds per bushel or 53 pounds per cubic foot.

A pure limestone should be selected for burning. Preferably its neutralizing value, expressed as calcium carbonate, should not be less than 90 percent. The presence of magnesium carbonate is not objectionable, tho magnesian lime does not slake so rapidly as high-calcium lime.

DIRECTIONS FOR CONSTRUCTING A LIME STACK*

Foundation. Lay down green logs about 1 foot in diameter and 16 feet long, with two-foot spaces between them, so as to make a base 12 to 16 feet wide. Fill the two-foot spaces with dry wood for starting the fire. If full-length logs are not available, shorter logs may be placed end to end to make up the necessary length. Green logs are used in the foundation only, because they will not burn readily and will hold the lime-stack off the ground so that a better draft is obtained.

*The method of building a lime stack described in this circular is based on information provided by County Agent M. H. Sasser.

Second Layer. Lay well-seasoned logs as large as can be obtained across the foundation logs. The thickness of this layer should be at least 2 feet. Place the logs as close together as possible. Leave a space 3 feet square in the center of this layer and fill it with well-dried wood. Leave a space 20 inches wide thru the 16-foot dimension of the stack for igniting the wood in the center. The stack should burn from the center outward.

First Stone Layer. On top of the second layer of logs, place 12 inches of stone (or stone equal to half the thickness of the logs beneath) varying in size from 1 to 6 inches in diameter. Large stones may be laid on the stack and broken.

Alternate Layers. Alternate layers of logs and stone are added, making each layer of wood about 6 inches less in thickness than the tier of wood beneath. Each layer of logs should be placed at right angles to the preceding one. The covering of stone should not be greater than one half the thickness of the logs beneath. It is not necessary to leave spaces for dried wood between the logs above the second layer, altho some small pieces 3 to 4 inches in diameter should be used. The stack may be 8 feet high. The stone should be broken into smaller pieces as the height of the stack increases.

Firing. In starting the fire the dry wood or kindling is ignited in the two-foot spaces in the foundation and in the three-foot square area at the center of the second layer. In order to permit uniform burning of all parts of the stack, it is best to fire it when there is little or no wind.

General Directions. Each layer of wood above the foundation should be drawn in on each side about one foot, so that the finished stack resembles the illustration, Fig. 1. It is not necessary to cover the top or sides with earth, altho the stack may be banked with 5 or 6 inches of earth to a height of three feet on the sides, as a means of conserving heat. The ends of the foundation logs should not be covered. The use of seasoned logs, except for the foundation layer, gives the best results. The cost of preparation is about two-thirds the cost of burning a lime stack. The cost of blasting powder for quarrying is so little that enough should be used to reduce the stone to the proper size for handling, as this method is cheaper than using a hammer.

Eighteen tons of limestone will be contained in a limestack

built to the dimensions shown in the illustration on Page 2. When completely burned, 18 tons of limestone produce about 9 tons of lime. Experience indicates that when limestone is not completely burned, for any reason, from 5 to 8 tons of lime are produced from 18 tons of limestone.

Where fine coal is available at a low cost, as is frequently the case in coal-field areas of Kentucky, coal may be used as fuel in addi-



Fig. 2. Front view of a limekiln.

tion to wood. Each layer of stone should be covered with enough coal to hide it. Fine coal may also be used as a covering for the top of the stack altho it should not be used in such a quantity as to prevent free draft.

PLANS FOR BUILDING AND BURNING A LIMEKILN

Size of Kiln. The dimensions, capacities and quantity of fuel

required to burn various sizes of kilns are given in the following table:

No. of Eyes	Length of Pit	Width of Excavation	Capacity in Tons of Stone	Fuel Required Cords of Wood
1	15 ft.	5 ft.	30	10
2	15 ft.	9 ft.	60	20
3	15 ft.	13 ft.	90	30
4	15 ft.	17 ft.	120	40

Excavation. As shown on the drawing, Fig. 3, the excavation for the kiln should extend into a hill 15 feet, having the top of the bank in the rear 6 feet to 10 feet above the bottom of the pit. The

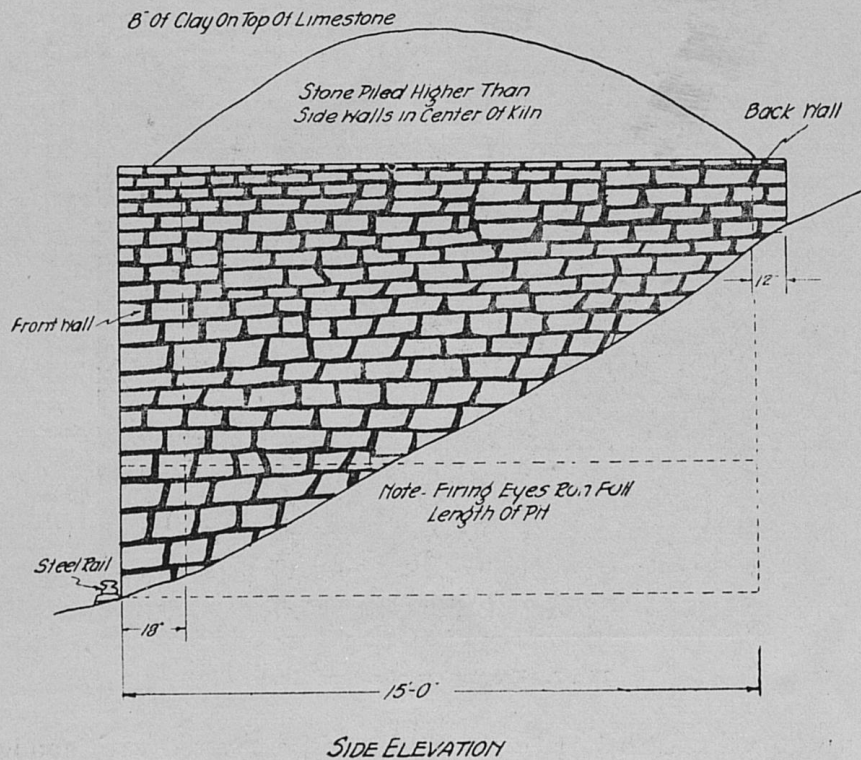
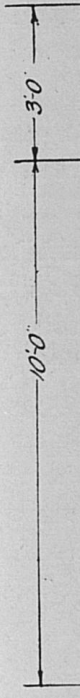


Fig. 3. Plan of a limekiln.

back and the sides should be made straight and perpendicular to the level bottom.

Building Eyes. The foundations for the "eyes", or fire boxes, are made by laying large, flat limestones in the bottom of the pit

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according to the dimensions shown. After the foundations are laid, construct the eyes, starting at the rear and finishing at the front. Smooth, flat stones should be selected for this purpose. The eyes are formed by extending each stone two or three inches over the one below, depending upon the thickness of the stone used, so that the eye takes the form of an inverted V about 36 inches high. A

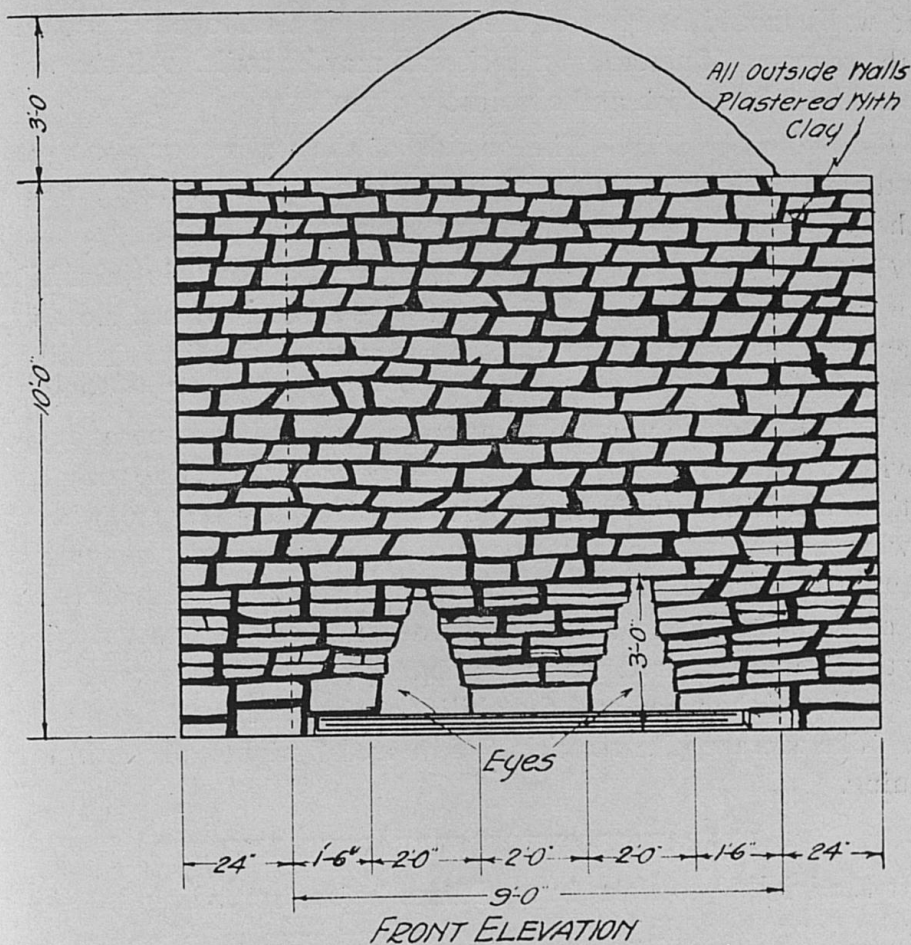


Fig. 4. Plan for limekiln.

flat stone about 6 inches thick and at least 2 feet long is laid across the gap at the top in place of using a keystone. All the joints should be broken and occasionally a long stone placed across the spans between the eyes, to tie them together. The stones in the walls of the eyes should be kept level.

Filling the Kiln. After the eyes are completed, and before building the outside walls, the pit should be filled to the top of the

ground with broken stones. The heavier pieces should be placed directly over the eyes and the smaller ones at the top of the kiln. Continue to fill the kiln with broken stone as the walls are built.

Building the Walls. The front should be built to a height of 10 feet. The side walls are built on the ground at the outside of the pit, extending up the slope from the front wall. The front and side walls should be level at the top and be tied together securely at the corners. If necessary, a back wall may be built. All the walls should be 2 feet thick and absolutely plumb.

Plastering the Kiln. The outside of the walls should be plastered with wet clay and the top of the kiln covered with at least 8 inches of wet clay or earth to prevent the escape of heat.

Firing. Well-seasoned cordwood is essential for firing the kiln. The stone should be seasoned for 12 to 14 hours with a slow fire when the firing is first started. After seasoning, the fires should be kept as hot as possible, so that the wood will be burned completely. Ashes should not be allowed to accumulate. It is not necessary to provide a flue, as sufficient draft is produced thru the rock and earth. The kiln usually is considered sufficiently burned when a crowbar driven into the top does not meet the usual resistance of the unburned stone. A sample of the burned stone taken from the top of the kiln should slake readily when placed in water. The length of time required for firing depends to a large extent upon the quality of the wood and the ability of the fireman to keep a hot fire. The average kiln requires 7 days and 7 nights of continuous burning.

PREPARATION FOR SPREADING LIME

It is advisable to slake burned lime before spreading it. This may be done by adding just enough water, gradually, to make it slake and crumble out dry. If too much water is added the lime will be pasty. It takes about 30 pounds or about four gallons of water to completely slake 100 pounds of fresh-burned lime. However, a smaller quantity than this will crumble the lime so that it can be spread. Burned lime will slake in time by absorbing water from the air. The unslaked burned lime may be placed in piles in the field and spread with a shovel when it becomes slaked. See Kentucky Extension Circular 59, Liming the Soil.