

UNIVERSITY OF KENTUCKY

COLLEGE OF AGRICULTURE

Extension Division

THOMAS P. COOPER, Dean and Director

CIRCULAR NO. 223

LOADING AND SPREADING MARL

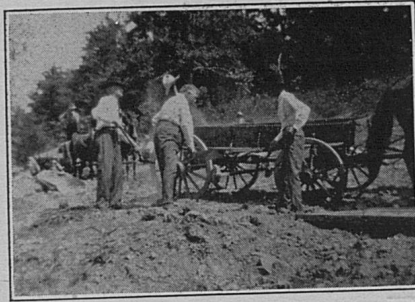


Loading marl with portable chute and tractor.

Lexington, Ky.

January, 1929

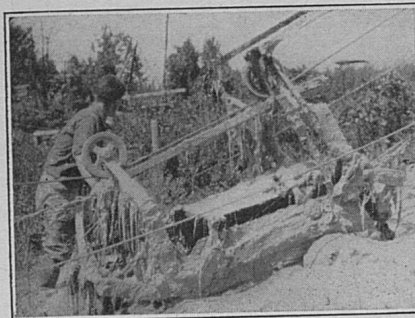
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Thirty-five minutes are required for three men to load and spread a two-ton load of marl by hand.



Twenty minutes are required for two men to load and spread a two-ton load of marl with a portable chute and a manure spreader.



In Michigan special equipment is required to excavate marl from lake beds.



In Kentucky marl lies on the surface with very little or no overburden.

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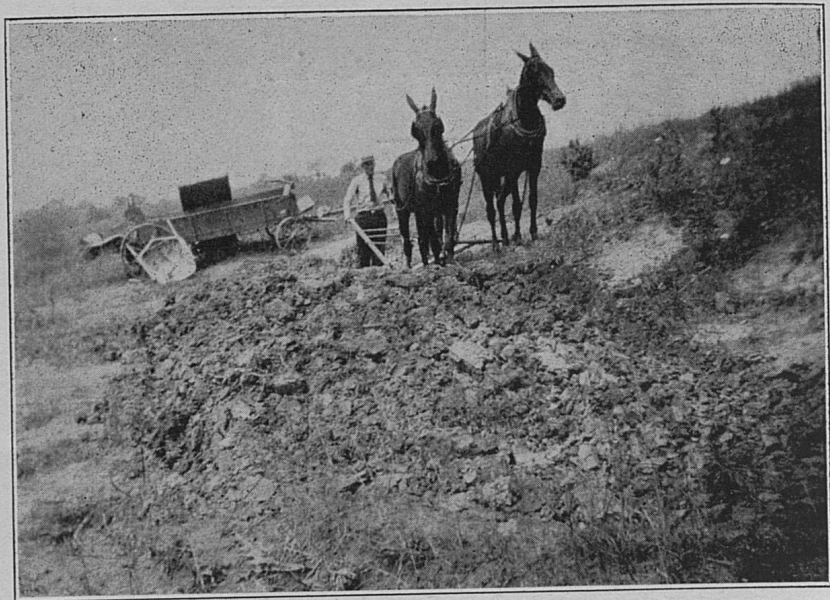
Loading and Spreading Marl

By EARL G. WELCH and S. C. JONES

To date, marl has been found in larger or smaller quantities in seventy counties in Kentucky. Of this number more than half contain deposits of considerable extent. Approximately two and one-half million acres, involving thirty thousand farms, in Kentucky can be limed with marl without exceeding a hauling distance of two and one-half miles.

Since the beginning of marl work in September, 1923, 4142 samples collected by members of the Department of Agronomy, county agents and farmers have been analyzed by the Experiment Station. During this period not over sixty thousand tons of marl have been used by farmers in the marl territory. The chief reason given by many farmers for not having used marl is that a great amount of tedious hand labor is required to load and spread it. During the summer of 1928 methods were developed that practically eliminated hand labor and enabled a man to apply marl at one-half the cost. Of the various methods tried, we have found the portable chute and slip scraper method to be most satisfactory. This method is described in detail in the following pages. The stationary chutes were used but found less efficient than the portable chute. They are illustrated, and their disadvantages are listed on page 9.

In 1928 Michigan farmers used 675,000 tons of marl where the cost of excavation alone was \$0.50 per ton, while Kentucky farmers used only 20,000 tons and can excavate and spread marl for \$0.50 per ton. See the last two pictures on the opposite page.



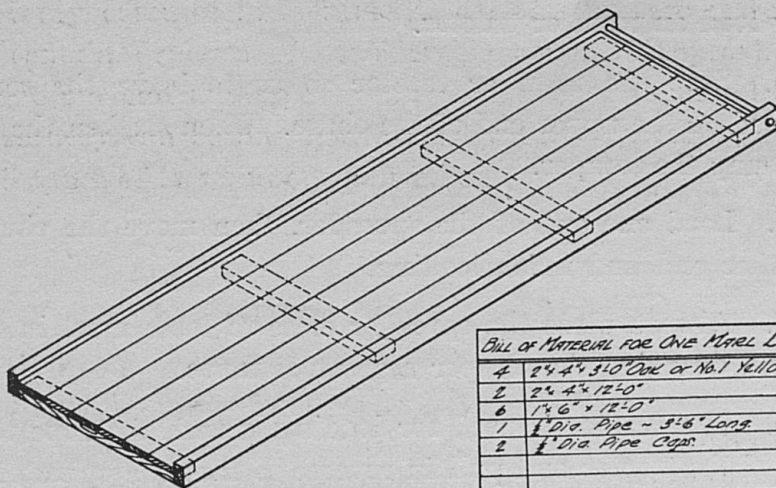
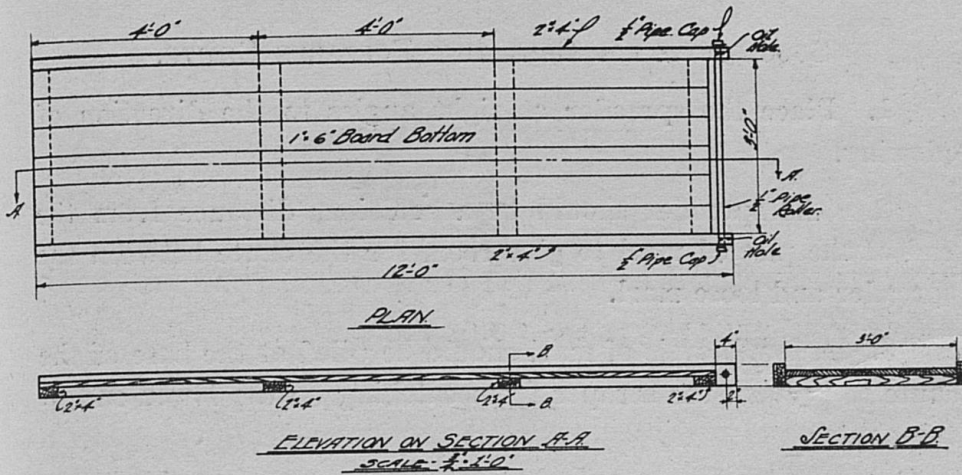
Plowing a marl bed before loading.

OPENING AND PLOWING THE MARL BED.

1. The overburden covering the marl bed should be removed to the greatest practical width and length to provide for future development.
2. The plowing should be done across the slope.
3. Marl plowed shortly before loading will handle better than marl that has been plowed for some time and allowed to absorb a great deal of moisture.

Equipment required for portable chute method of loading marl.

1. Portable chute.
2. Slip scraper.
3. 50 ft. of $\frac{3}{4}$ -inch rope.
4. 2 open hooks.
5. Team or tractor power.
6. Wagon or manure spreader.
7. Doubletree if team is used.



ISOMETRIC VIEW

BILL OF MATERIAL FOR ONE MARL LADDER	
4	2 1/2" x 3'-0" Oak or No. 1 Yellow Pine
2	2" x 4" x 12'-0"
6	1 1/2" x 6" x 12'-0"
1	1/2" Dia. Pipe - 3'-6" Long.
2	1/2" Dia. Pipe Caps.

Building plan for the portable chute.

ADVANTAGES OF THE PORTABLE CHUTE.

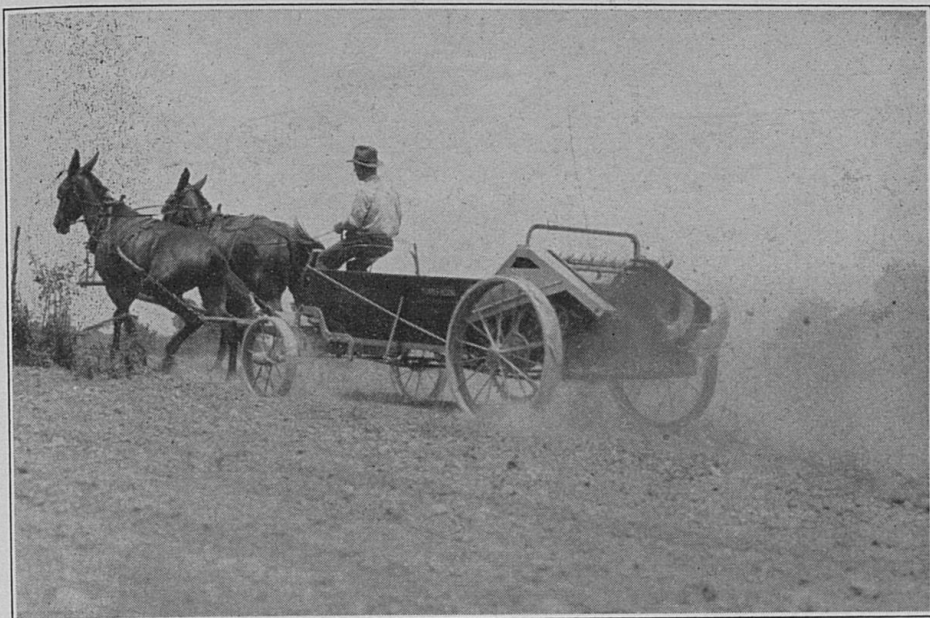
Advantages of the portable chute method of loading marl are:

1. The most efficient method of loading marl.
2. Low cost of construction of chute.
3. The chute is easily moved from one bed to another.
4. It does not have to be adjusted to height of wagon or spreader.
5. Can be easily moved to various parts of the marl bed to save labor in loading.

SUGGESTIONS FOR OPERATING PORTABLE CHUTE.

1. Place the spreader at right angles to the direction of plowing.
2. The spreader should be a sufficient distance from the end of the plowed marl to give room for the chute between the spreader and loose marl.
3. A few shovels of marl should be piled at the base of the chute to prevent the scraper from catching on the lower end of the chute.
4. Load the scraper gradually so as not to put an extra heavy load on team or tractor.
5. Stop the team or tractor so as to leave the scraper balanced on the upper end of the chute. Then slacken the cable and dump the scraper.
6. Load one end of the spreader, then move the chute to the other end and finish loading.
7. Always place the spreader close to loose marl in order to avoid dragging the scraper a great distance.
8. If a tractor is used for loading, attach the rope to the front of the tractor and pull in reverse so that the operator can see when to stop.
9. Open hooks should be provided for each end of the cable to facilitate the handling of the cable.
10. Time can be saved by keeping a team or tractor at the power end of the cable so as to eliminate the necessity of using the spreader team or tractor for loading.

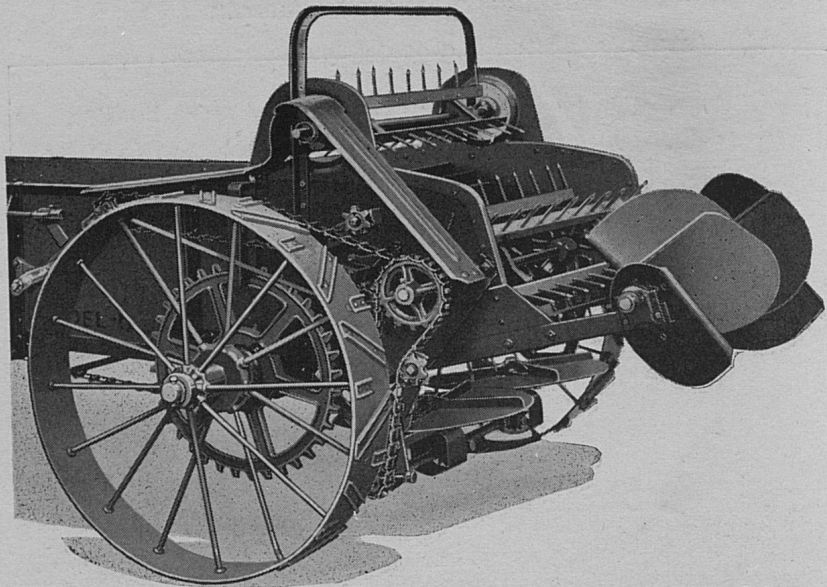
METHODS OF SPREADING MARL.



The manure spreader is the most practical machine for spreading marl.



The end gate spreader can be used for spreading marl when the marl is fine and free from stones.



Disks similar to those of an end gate spreader can be obtained for one make of manure spreader.



These disks spread marl or limestone more evenly and to a greater width.

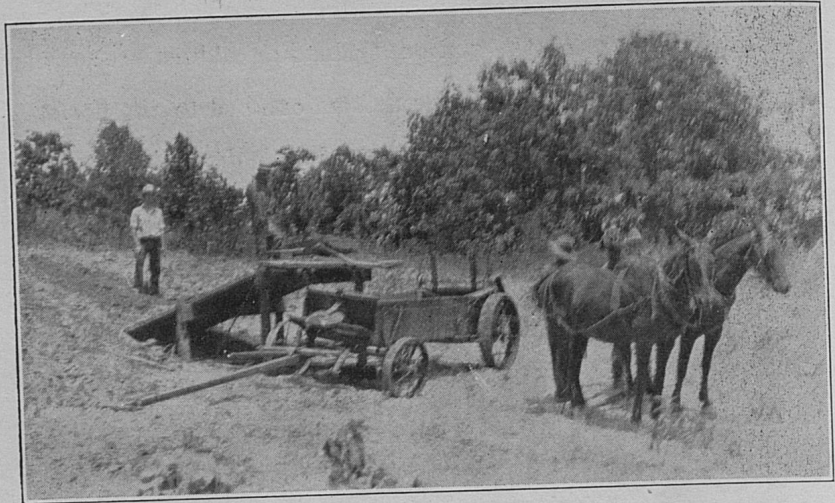
OTHER METHODS OF LOADING MARL.

Disadvantages of the stationary loading chutes are:

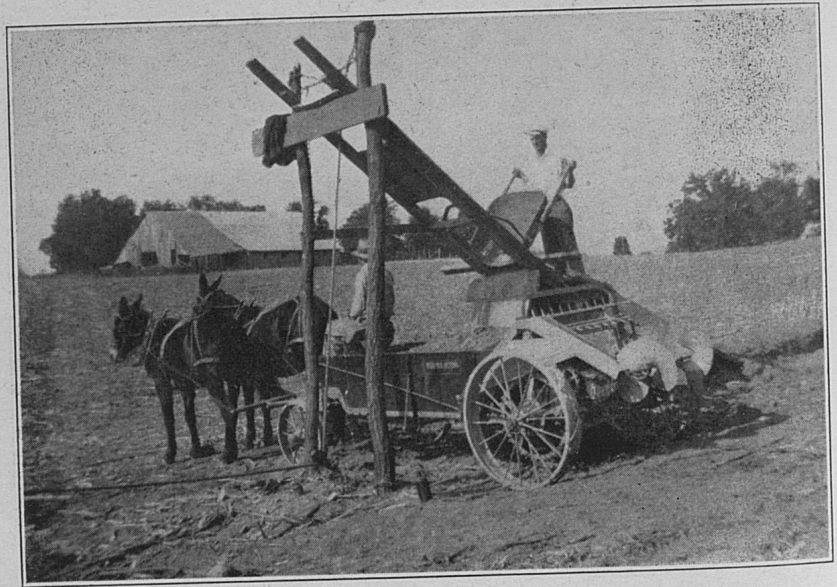
1. They are not easily moved from one bed to another.
2. They are more expensive to build than the portable chute.
3. The marl must be moved greater distances to the foot of the chute.
4. Some are not easily adjusted to various heights of wagons or spreaders.



Trapdoor method of loading marl.



The stationary chute originated in Henry County.



Stationary chute used in Union County.

HOW TO DISTINGUISH A GOOD MARL FROM A POOR ONE.

1. The marl that has a sandy or granular look and feel usually is higher in neutralizing value than one that has a smooth or soapstony feeling and a slick or glassy appearance.

2. When a little diluted commercial hydrochloric (soldering) acid is poured on a good marl, it effervesces or bubbles vigorously, while there is little or no bubbling when the acid is poured on a poor marl.

3. If the owner is in doubt as to the neutralizing value of the marl a mixed sample taken from various parts and depths of the bed so as to represent an average of the available supply may be sent to the Experiment Station at Lexington for an analysis without cost.

4. For additional information concerning marl, write for Experiment Station Circular No. 32, "Marls for Liming Soils."



A marl bed in Nelson County.

How to spread lists from a single source to a large number of nodes in a network is a well-known problem. In this paper we consider the problem of spreading lists from a single source to a large number of nodes in a network. We assume that the network is a tree and that the source is at the root. We consider two models: the first model is the standard model where each node can only spread the list to its children; the second model is a more general model where each node can spread the list to any of its neighbors. We show that in the first model the number of nodes that receive the list is at most $n/2$, while in the second model it is at most $n/3$. We also show that these bounds are tight.

Let T be a tree with root r . Let L be a list of nodes. We say that a node v is reached by L if there is a path from r to v such that all nodes on the path are in L . We say that a node v is spread by L if there is a path from r to v such that all nodes on the path are in L and all children of v are also in L . We say that a node v is spread by L in the second model if there is a path from r to v such that all nodes on the path are in L and all neighbors of v are also in L .

Let $f(T, L)$ be the number of nodes reached by L in the first model, and let $g(T, L)$ be the number of nodes spread by L in the second model. We show that $f(T, L) \leq n/2$ and $g(T, L) \leq n/3$. We also show that these bounds are tight.

For example, let T be a star graph with n nodes. Let L be the list containing the root and one of its children. Then $f(T, L) = 2$ and $g(T, L) = 2$. For another example, let T be a path graph with n nodes. Let L be the list containing the root and every second node. Then $f(T, L) = \lceil n/2 \rceil$ and $g(T, L) = \lceil n/3 \rceil$.



A tree T with root r and list L .

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