

CIRCULAR 61

(Reprinted 1937)

Duplicate

AUGUST 1932

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An Inexpensive Machine for Filling The Trench Silo

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By

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SILAGE is an excellent feed for beef and dairy cattle. It is especially valuable during the dry fall and winter months when pasturage and other green feeds are not available.

In the past the use of silage has been limited because of the expensive equipment considered necessary for its production. The man with only a few cows could not afford the necessary cost of constructing a vertical silo of concrete, hollow tile, or wood, and of securing a silage cutter and the power with which to operate it; however, since the development of the trench silo, as described in Alabama Experiment Station Circular 59, and the machine for filling it, described in this publication, silage may be provided for even a small herd at a nominal cost.

Cost of Building the Trench Silo.—Very little if any cash outlay is necessary to build a trench silo. There are seasons of the year when men and mules are idle on practically every farm; labor at such a season should cost very little. The tools necessary are a turnplow, pick, shovel, and slip scrape, all of which are found on the average farm, with the exception of the slip scrape. A slip scrape can be bought for about \$12 and it can be used later for terracing and various odd jobs around the farm.

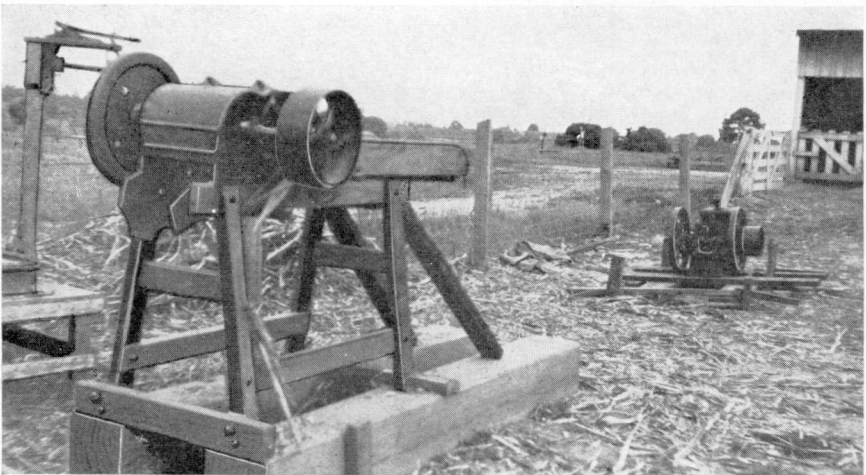


FIGURE 1.—Showing how the machine and engine should be braced.

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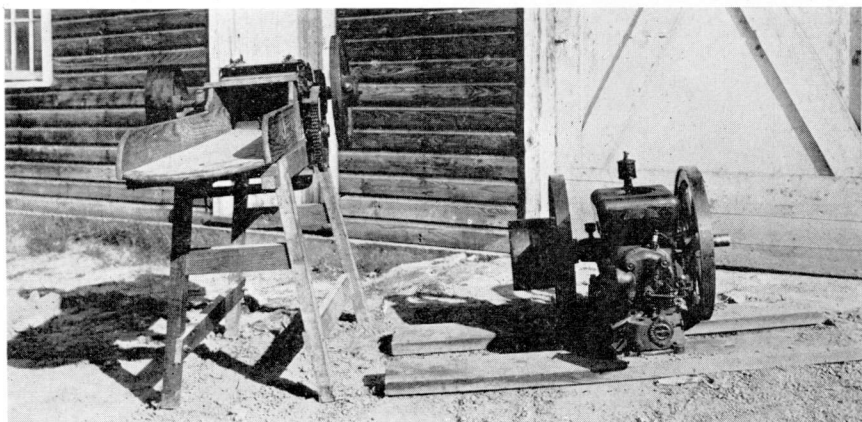


FIGURE 2.—End view showing the 3-horse-power gas engine and small feed cutter used for cutting sorghum silage for the trench silo.

Even if a reasonable wage is charged for man- and mule-labor, the cost of digging a 50-ton silo should not exceed \$20 to \$25.

Small Power Feed Cutter.—A small feed cutter, without a blower, which may be purchased for about \$⁵⁶30, was tested during the fall of 1931. This machine has sufficient capacity for filling a trench silo and requires only a small amount of power. If a tractor is not available, a small gas engine is sufficient for its operation. The cutter was mounted on legs instead of wheels. It was necessary to anchor and brace the machine, as shown in Figure 1, in order to keep the driving belt running tight. The small gas engine used for operating the cutter was also placed on a platform and anchored.

The machine has four 11-inch curved knives which can be easily replaced and are quickly adjustable. Various lengths of silage can be obtained by adjustment of the feed rollers. The cane is fed into the cutter by hand and the feed rollers carry the cane over a steel shearing bar where it is cut into short lengths by the revolving knives.

Test of Feed Cutter for Filling the Trench Silo.—This feed cutter was tested for cutting sorghum cane. The cutter was placed beside the silo and the silage fell into the trench when cut. The results of the capacity tests with three different sources of power are shown in Table 1.

The cutter required 3.83 horse power for cutting at maximum capacity as determined by the electrical consumption. It was concluded that a 4-horse-power engine with a 16-inch-diameter pulley running at a speed of 400 revolutions per minute would supply ample power for the full operating capacity of the cutter without overloading the engine. By using an engine with

TABLE 1.—The Capacity of the Small Power Feed Cutter Using Different Sources of Power at Various Speeds.

Source of Power	Diameter of pulley	Motor speed R P M	Cutter speed R P M	Cutter capacity in tons per hour
15-30 H P tractor	16.5	400	550	4
3 H P gas engine	10	425	360	3.45
5 H P electric motor	4.5	1,740	670	3.21*

Note: A 12-inch pulley was used on the feed cutter.

*This low rate was caused by slippage of the belt and from the small, high-speed pulley of the electric motor together with the irregular rate of feeding the machine.

these specifications and feeding the cutter to its maximum capacity, it is possible to cut 40 tons of silage in ten hours. However, it is exceedingly difficult for one man to feed this machine to its maximum capacity because of the small opening through which the cane is fed.

Care of the Cutter.—This type of machine is generally weaker in construction than the heavier cutters designed for large units of power and high speed. More care, therefore, is required in its operation to obtain its maximum life and efficiency. The cutter should be oiled about every hour with heavy motor oil or its equivalent. Oiling can be done without stopping the cutter and will take only a few seconds. In case the Babbit bearings are damaged from over-speeding, excessive grit, or lack of oil,



FIGURE 3.—Trench silo on Alabama Experiment Station farm.

they can be poured at any blacksmith shop or garage. This, however, may happen when time is very valuable and can be avoided by careful attention to lubrication. It is advisable to always check the alignment of the knives and tighten or re-adjust loose bolts, bearings, etc., after using the cutter so that it will be in first-class condition for the next job. When the machine is stored all metal parts should be oiled thoroughly or covered with grease and the machine placed in a dry shed to prevent rusting and warping of the apron.

Speed of the Cutter.—Where ample power is available, there is a tendency to run a machine much faster than the speed for which it was designed. This is not only dangerous and constitutes a waste of power but results in shortening the life of the machine. In the tests the maximum amount of silage was obtained when the cutter was running at a speed of 550 revolutions per minute. When driven at a greater speed, vibration of the cutter was quite noticeable. It was considered that this was the maximum speed for this machine.

It is a rather simple matter to figure the size of a pulley for any desired speed. If one knows the speed of the engine, the desired speed of the cutter, and the size of the pulley on either the engine or cutter, the size of the other pulley can be calculated from the following formula.

$$d \times r = D \times R$$

where d = diameter of pulley of driver

r = revolutions per minute of the driver

D = the diameter of the pulley of the driven

R = the revolutions per minute of the driven

For example, if a tractor or gas engine, which has a pulley 11 inches in diameter, is running at a speed of 600 revolutions per minute, what size pulley is required on the cutter to run it at 550 revolutions per minute?

Substituting in the formula:

$$600 \times 11 = D \times 550$$

$$6600 = 550D$$

$$D = \frac{6600}{550} = 12''$$

D = 12 inches, diameter of pulley for cutter.

Removing Silage from the Trench.—In some instances the trench silo may be located at a considerable distance from the barn and, since silage is rather heavy and bulky, it will become burdensome to carry it in baskets or tubs. In such cases a track and feed carrier may be installed or a two-wheel cart with shafts can be made with little expense. Wheels for the cart can be found at most garages or junk piles, and a box or bed of the desired size can be bolted on the axle and properly braced.

Homemade shafts and singletrees can be made from poles. This cart can be backed into the trench by a mule or horse and silage easily moved to the feeding troughs.

SUMMARY

The cost of ensilage may be kept low if a trench silo and a small feed cutter are used. The cost of digging a 50-ton trench silo should not exceed \$25. A small feed cutter with sufficient capacity for filling the silo may be obtained for about \$30. A blower is not necessary.

Tests showed that a 4-horse-power gasoline engine furnished ample power to operate this machine at its maximum capacity of 40 tons of ensilage per day. Suggestions for operation and care of this machine are included.

