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GRINDING GRAIN WITH ELECTRIC POWER

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The feeding of ground grain to dairy cattle, poultry, and hogs is a general practice on most Michigan farms. This practice is recommended by the Michigan Agricultural Experiment Station with the following exceptions:

1. Feed whole corn to hogs.
2. Whole grains or cracked grains for poultry scratch feed.
3. Whole grain to calves to six months of age, when skim milk is fed in the proper amount.

Grinding of small grains, oats, barley, wheat, and rye, increases their feeding value and digestibility and lessens losses from incomplete digestion.

The advisability of grinding corn will depend upon the animal to which it is fed and the method of handling the excrement.

Where home-grown grain is fed, the farmer is faced with the problem of doing the grinding on the farm or of taking the grain to a custom mill.

Custom Mill Grinding

The custom mill charge for grinding grain is between 10 and 15 cents per bag, or an average cost of 12 cents per hundred weight ($2.40 per ton). In addition to this cost, there is the farmer's time and labor to be considered in:

1. Bagging the grain.
2. Loading grain on wagon, truck, or auto.
3. Journey to mill.
4. Unloading grain at mill.
5. Waiting while grain is ground.
6. Loading the grain and return trip.
7. Unloading and storing ground grain at the farm.

The greater the distance the mill is from the farm, the greater the hauling expense.

What the cost of these items of expense amounts to is hard to compute. In many instances, going to the custom mill is combined with other business

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requiring the same trip; but it is also true that custom milling makes it necessary to handle the grain five different times, requiring a definite amount of time and labor, regardless of the time spent on the road or the oil and gasoline consumed.

Home Grinding

Grinding the grain on the farm assures a constant supply of feed without the annoyance of leaving the farm during a busy time or in inclement weather.

The expense of grinding at the farm may be less or greater than at the custom mill depending upon the kind of grinder used, the kind of power used, the amount of grain ground, and the system of grinding pursued.

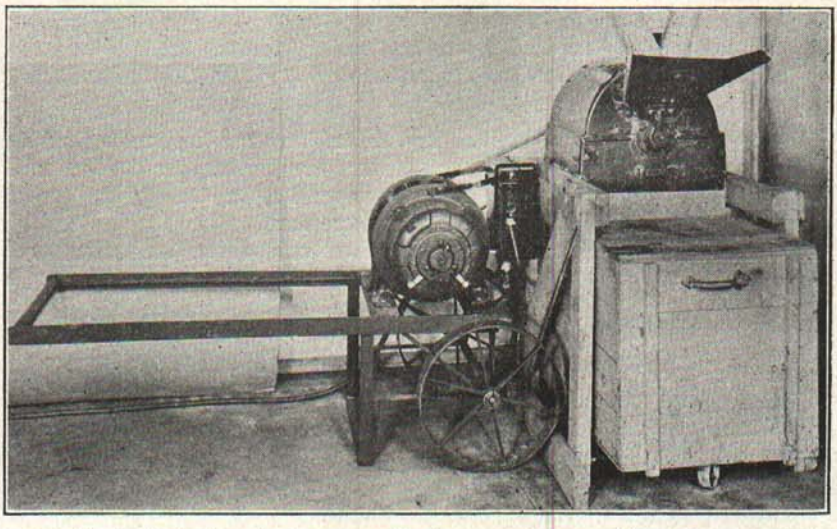

Fig. No. 1. Whole grain from overhead storage conveyed to hammer mill by gravity. Ground grain drops into feed truck. Five H. P. portable motor can be used on other jobs.

Three forms of power used in home grinding are tractor, gas engine, and electricity.

Electric power on farms having central station service is both economical and practical for grinding grain. The electric motor starts readily in cold weather and time and labor in grinding grain can be largely eliminated. The electric motor is adapted to automatic operation and may be located at practically any point desired.

With the use of the electric motor in automatic or semi-automatic operation, one factor of real importance should always be considered, which is to utilize the smallest power unit that will do the work satisfactorily. This results in decreased investment for equipment, less expense in heavy wiring, and lower operating costs. The element of time or the amount of grain ground per hour is of minor importance. The items of real importance are:

1. That the grain is ground satisfactorily.
2. That little or none of the farmer's time is required in feeding the mill or caring for the ground grain.
3. That the cost of electric energy is lower than other sources of power.

Types of Mills

Buhr Mill. In the buhr mill, grain is ground between two plates with corrugated surfaces; one plate is stationary and the other revolves.

Attrition Mill. The attrition mill is constructed on the same basis as the buhr mill except that both plates revolve in opposite directions.

Both these mills grind by friction, the grinding plates are kept in contact by springs when the mill is empty. If the mill should be run in this condition, the cutting edges of the plates are worn off and the buhrs become dull. Dull buhrs greatly increase the power requirements of grinding. Material such as wire, nails, or small pebbles, which may be in the grain, also wear down the cutting edges of the buhrs and often cause breakage.

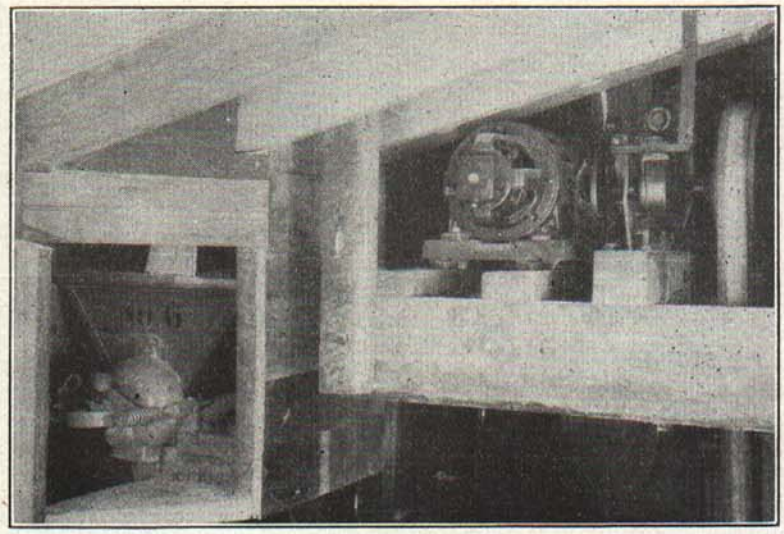

Fig. No. 2. One H. P. motor used to operate grain elevator (right) and six-inch buhr mill. Ground grain drops into feed bins in dairy barn.

Satisfactory grinding is done with the buhr or attrition mill when the buhrs are sharp, when magnets are used in the feed line to collect bits of metal, and when the mill is not allowed to run idle.

Hammer Mill. The hammer mill depends upon breaking up the grain by impact. The mill is equipped with a number of steel beaters which revolve very rapidly inside the housing of the mill. As the whole grain enters the mill it is struck rapid and powerful blows by these beaters and is reduced to ground grain. There is no metal to metal contact in the grinding process. The ground grain leaves the mill through a screen in the bottom. Different

size screens permit the grain to be ground to the fineness desired. The ground grain may be allowed to drop directly into a feed truck or bin, or a blower fan may be used to elevate or convey the grain to storage.

This type of mill is especially adapted to automatic operation. It can run empty without harm, and metal or other foreign material in the grain does not cause damage or interfere with the operation of the mill.

Hammer mills for farm use range in size from 2 H. P. to 5 H. P.

A general recommendation, where there are other uses for a 5 H. P. motor such as filling silos, buzzing wood, or elevating grain, is to use the 5 H. P. portable farm motor with a 5 H. P. mill. Where the farmer has no use for the 5 H. P. motor, the small mill and a 2 or a 3 H. P. motor is a practical unit for permanent installation.

The proper installation of equipment of this kind is very important, figures No. 1 and 2 illustrate installations where grain is ground daily, gravity feeds the whole grain to the mill, and the ground grain into the feed truck.

The amount of current used in grinding with a hammer mill is about 20 kilowatt hours per ton (oats medium fine). The amount of current used is fairly constant because the impact elements are not much changed by use.

The amount of current required by the buhr mill varies as to the sharpness of the buhrs. With very sharp buhrs, as low as 5 kilowatt hours per ton may be all the current needed, but, with dull buhrs as high as 73 kilowatts per ton may be required.

A ton of grain ground in a hammer mill with electric energy at 12 cents per kilowatt hour would cost the same as custom grinding at $2.40 per ton. At 3 cents per kilowatt hour, an average farm power rate in Michigan, the cost of grinding would be $0.60 per ton. The $1.80 per ton saved would pay 6 per cent interest on an investment of $300.00 in grinding 10 tons of grain per year. The time and labor saved should more than pay for the depreciation on the equipment. Should the motor be used for additional purposes, the saving would be proportionally greater.

Electric Motors

The purchase of an electric motor should be given careful consideration. An electric motor is a power unit that can be expected to give years of service. "Bargain" motors and motors made by other than reputable companies often prove a costly investment. Advice from the company supplying service will aid in selecting a good motor.

It is necessary that the *phase* and *cycle* of the electric service be known before the motor is ordered. Farm service is usually single phase, 60 cycle.

Motors for power use should be protected from overload by a thermal overload relay. Portable farm motors are equipped with a magnetic switch and thermal overload relay.

Installation

While there is little fire hazard connected with properly installed motors, they should be protected from dust. Also accumulations of oil and dust should be wiped from the surface with a cloth as a safety measure and to allow efficient cooling.