Grinding and Elevating Grain with One-Half H.P. Motor
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GRINDING AND ELEVATING GRAIN WITH ONE-HALF H.P. MOTOR

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Where electric energy is available for farm use, it is possible and highly practical to do many of the farm tasks with smaller power units and less expensive equipment than formerly were required. A good illustration of this principle is the simple home-made elevator and the small burr mill feed grinder, (Fig. 1). The elevator can be constructed at a cost for material of twenty dollars or less. The burr mill is a standard commercial product selling under eight dollars. The elevator will elevate at the rate of 200 bushels per hour; 500 bushels per kilowatt hour. The mill will grind at the rate of 200 pounds per hour; one ton per 12 kilowatt hours. A one-half h. p. electric motor is ample power for either job.

The Elevator

Figure 2 illustrates the construction details of the elevator; a single shaft (elevator leg) is used instead of the customary double shaft. Small elevator pulleys replace the ordinary large pulleys. The sides may be lumber or twenty-gauge galvanized iron. The height may be any height up to 20 feet.

Other Materials

Elevator belting, 4-in.-4-ply	$0.18 per ft.
Elevator buckets, 3½-in. x 3-in.	.14 each
Elevator bucket bolts, flat head	1.75 per 100
Three feet of 1-in. steel shafting	.17 per ft.
Twelve-inch pump jack pulley (drive pulley)	1.00
Two 4-in. x 4-in. wood split pulleys	1.85 each

Details of Elevator Construction

The elevator belt should fit close to the two sides, allowing only enough clearance to avoid binding. Excessive clearance between the belt and sides permits grain to sift behind the belt and to wedge around the pulleys.

The elevator pulleys should be in line to keep the belt from creeping and should be faced with belting to decrease slippage.

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The buckets should be spaced uniformly on the belt, a minimum distance of 6 inches and a maximum distance of 12 inches. The throat of the hood at Point A, Figure 2, should be below bucket B as bucket C is being emptied; otherwise, part of the grain falls down the shaft and plugs the elevator.

The grain should enter the elevator about three inches above the bottom Y, Figure 2. Grain entering at the bottom of the elevator banks against the buckets; grain entering at points higher than three inches has no appreciable effect on the operation.

To avoid bridging, all inclines on which grain travels should be at a 30 degree or greater angle.

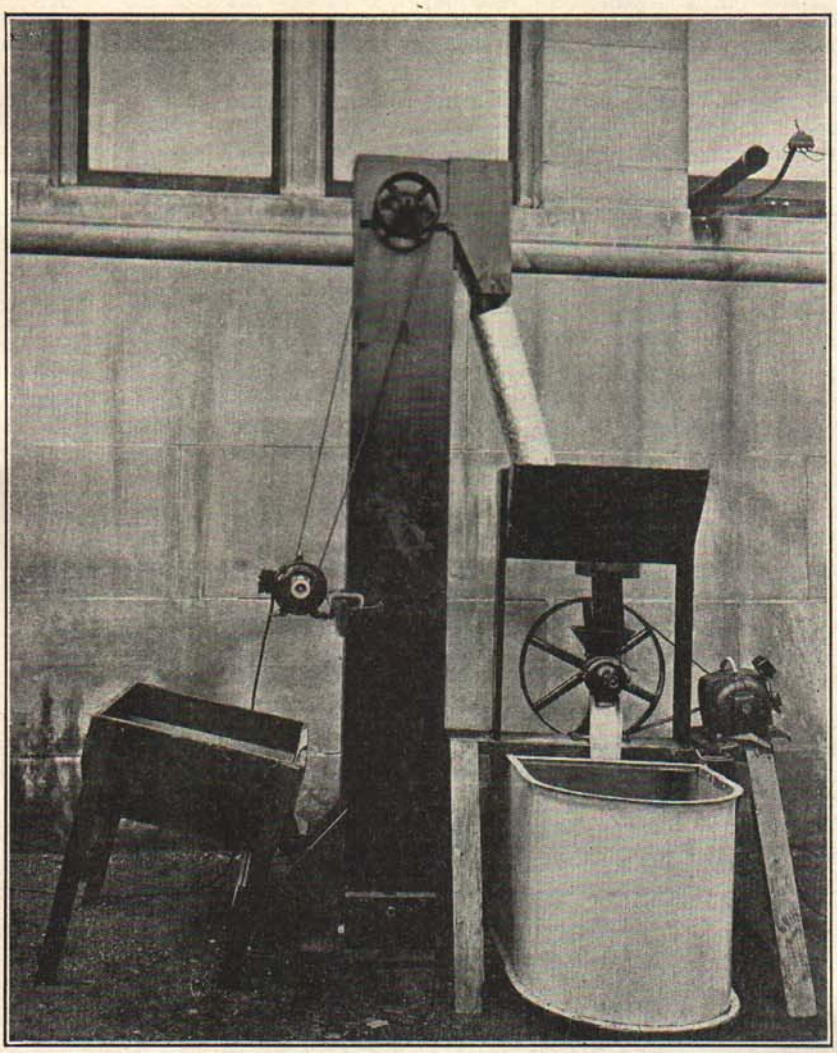
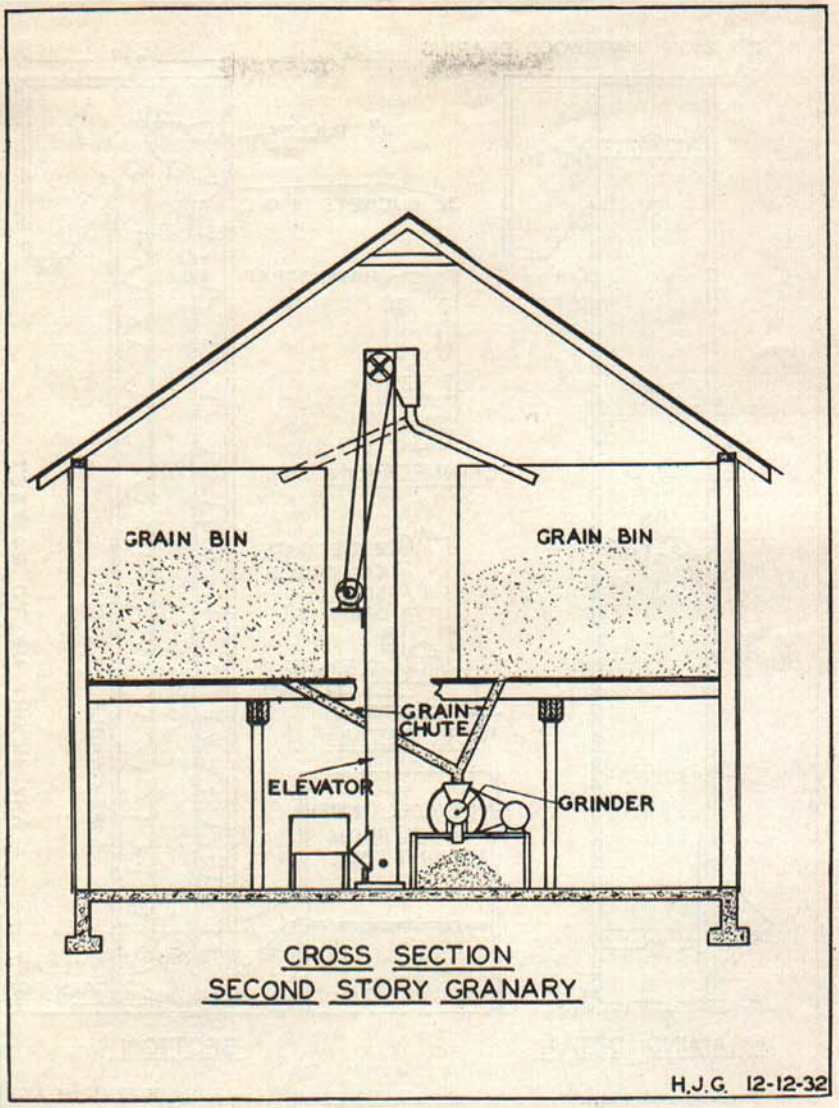


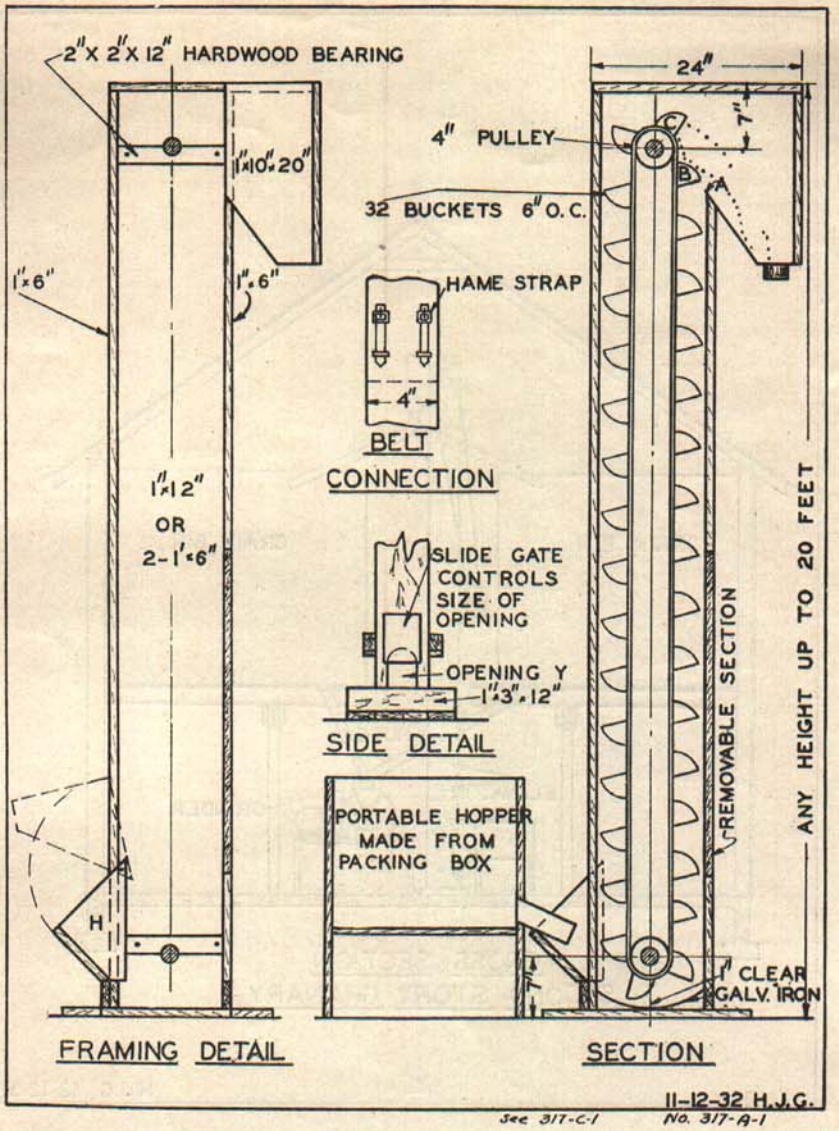
Fig. 1.—The essential feature of small grinders is that the grinding operation may be conducted without an attendant.



Recommended Speeds

	Belt speed feet per minute	Height elevator	R. P. M. elevator pulley head	Diameter motor pulley
Buckets 6 inches apart.....	305.5	To 10 feet	291.7	2 inches
Buckets 12 inches apart.....	534.5	Over 10 feet	510.4	3½ inches

Capacity at above speeds in bushels per hour; oats 190, wheat 220, barley 214, corn 243.



Operation

It is desirable to mount small portable motors on a hinged base so the weight of the motor keeps the belt tight. (See Figure 1.)

A wide base or supporting legs are not needed to keep the elevators below 10 feet in height from tipping on a reasonable level floor.

The elevator hopper H., Figure 2, may be readily raised to clean the elevator if plugged.

The elevator should be emptied before the motor is stopped or started.

The grain hopper may consist of a packing box, barrel, or similar con-

tainer, since sloping bottoms or fancy designs are unnecessary. In flat bottom hoppers the grain forms its own incline and but little is left in the hopper.

The weight of an elevator 10 feet in height is below 100 pounds. They can be carried readily to new locations in filling or emptying different bins.

The power requirement is approximately one-fourth h. p.

Home Grinding

The difference in feeding value between ground and unground grain does not generally warrant high grinding costs. In the case of home grinding, the lower the cost of equipment and the lower the operating costs the greater are the profits from grinding.

The grinding assembly (Fig. 1) consists of a 4½-inch standard burr mill with 20-inch drive pulley. Mills of this type can be purchased under eight dollars. A standard one-half h. p. motor equipped with a starting and stopping protective switch and 3-in. x 3-in. fibre pulley can be purchased for $35.00 or less.

The capacity of the mill varies with the kind of grain ground and the fineness of grinding. The amount of current consumed varies from eight K. W. H. per ton (mixed grains; medium fine) to 30 K. W. H. per ton (oats fine). In Table No. 1 are the results of a number of grinding tests.

Table No. 1

Motor ½ h. p., pulley 3 inches diameter, burrs, fine. Speed of mill 262.5 r. p. m.

Grain	Ground	Pounds per hour	K. W. H. per 100 lbs.	K. W. H. per ton
Oats	*Fine	40	1.5	30
	†Coarse	60	.7	14
Barley	Fine	70	.6	12
	Coarse	145	.5	10
Wheat	Fine	100	.6	12
	Coarse	180	.3	6
	Cracked	350	.3	6
Corn	Fine	35	1.	20
	Coarse	90	.4	8
	Cracked	400	.2	4
Mixed	Fine	120	.6	12
(Above)	Medium Fine	220	.4	8

* Fine; Poultry Mash; Commercial corn meal; Whole Wheat flour.
† Coarse; Dairy cattle feed.

One hour of grinding each day will generally care for a herd of 20 cows. The dust density factor of this method of grinding was negligible as a source of danger from explosion or fire.

One set of fine burrs permits a range in fineness of grinding from whole wheat flour to cracked corn. The energy consumed in grinding a ton of fine grain is two or three times greater than the amount required to grind a ton of the same grain coarse. The small burr mill will not grind roughage or ear corn; it takes approximately three times as much current to grind ear corn as it does to shell and grind the same amount of shelled corn. Burr

replacement, under $1.00, ordinarily is a minor expense; one set of burrs was used in grinding approximately 500 bushels of mixed grain with no apparent damage to the burrs.

Operation

The essential feature of small grinders is that the grinding operation may be conducted without an attendant. The whole grain should be conveyed to the mill by gravity from overhead storage bins. The storage bin may be large enough for only one day's feed supply or in the case of the second story granaries, the mill may be located beneath the main storage bins and the grain spouted direct to the hopper of the mill. The ground grain should drop into a bin or feed truck beneath the mill.

Figure No. 1 illustrates a practical working assembly of the small burr mill and one-half h. p. motor. Both units are mounted on a sawhorse. A small overhead storage bin insures gravity feed to the mill, and the ground grain drops into a feed truck. The feed truck is a galvanized iron stock tank 2-ft. x 2-ft. x 4-ft. mounted on 4-in. wheels.

Burr mills should not be run empty as the cutting edges of the burrs are rapidly worn when the burrs are in direct contact with each other. A magnet in the whole-grain feed line is desirable to keep metal scraps from the burrs.

A flat drive pulley on the motor permits the belt to jump the pulley when the mill is suddenly stopped as may be the case with tramp metal wedged in the grain agitator. This kind of automatic stoppage prevents overheating and damage to the burrs.

The Motor

A one-half h. p. repulsion induction or condenser type motor is recommended for four and one-half inch burr mills. Split phase motors should not be used on jobs of this nature as they do not start well under heavy load.

The motor should be equipped with a circuit breaker switch, six ampere capacity for 220 volts; 12 ampere capacity for 110 volts. The switch furnishes the motor protection from overload and simplifies the starting and stopping operation.

The mounting of the motor should be as simple as possible so that it can be readily moved to different jobs. The greater the number of jobs the larger the return on the investment in the motor.

The one-half H.P. Portable Motor is adapted for use with the grain mill, grain elevator, grindstone, emery wheel, corn sheller, fanning mill, eight-inch power saw, clipping machine, churn, meat grinder, concrete mixer, and paint sprayer. Some of these operations require only one-fourth H.P., but, as they are seasonal in nature and of comparatively short duration, it would be more economical to operate with a one-half H.P. motor than to have an additional investment in two small portable motors of different sizes.