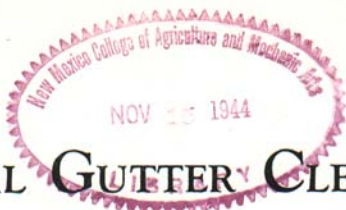


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MECHANICAL GUTTER CLEANERS

By Richard L. Witz and Arthur J. Bell



MICHIGAN STATE COLLEGE :: EXTENSION SERVICE

EAST LANSING

Michigan State College and U. S. Dept. of Agriculture cooperating. R. J. BALDWIN,
DIRECTOR, EXTENSION SERVICE, Michigan State College, East Lansing. Printed and
distributed under acts of Congress, May 8 and June 30, 1914.

ACKNOWLEDGMENT

The authors express appreciation to the owners (or operators) of the following farms for their generosity in supplying information on their gutter cleaners. This information has made this bulletin possible. Space does not permit descriptions or pictures of all the cleaners in the state; those chosen were used because they were particularly typical or because photographs were available.

George Alger farm, Washtenaw County
Davis Brothers farm, Lapeer County
Menno Esch farm, Oscoda County
Martin Geerlings farm, Ottawa County
C. E. Hansen farm, Mason County
Nelson Lehman farm, Arenac County
Eugene Livingston farm, Tuscola County
Harold Pierce farm, Branch County
William Schultz farm, Arenac County
Roy Wisner farm, Arenac County
Dale Woolcott farm, Van Buren County

Mechanical Gutter Cleaners

By RICHARD L. WITZ and ARTHUR J. BELL

ONE OF THE DAILY CHORES ON MOST FARMS WHICH CONSUME CONSIDERABLE time and labor is cleaning the gutter. Several farmers in Michigan and other states have tried to eliminate most of this work by installing mechanical gutter cleaners. In fact, Martin Geerlings, Holland, Michigan, has used this method of handling the manure from his dairy barn since 1929.

Although experimental data regarding gutter cleaners for dairy barns are not available at this time, interest in this equipment is such that it seems desirable to describe the types now being used on Michigan farms and to call attention to the economies and labor-saving possibilities of this method of handling manure.

The first cost of a gutter cleaner varies from \$50 for a simple farm-built cleaner, using second-hand parts, to \$500-\$600 for a commercially built unit. Under most conditions, the cost of this equipment should compare favorably with the installation of a litter carrier system. According to the owner of one of the cleaners described in this bulletin, the gutter cleaner saves him 440 hours of hard work each year.

If the first cost of a gutter cleaner installation is assumed to be \$500 more than the cost of simple hand equipment, such as a wheel barrow or cart, the total annual cost of use including a \$1 or \$2 charge for electric energy should not exceed 20 percent, or about \$100. In order to pay for itself under these conditions, the cleaner would need to save only 200 hours of labor at 50 cents per hour.

There are two general types of gutter cleaners: (1) The apron or conveyor type (see Figs. 1 to 4) and (2) the drag type (see Figs. 7 to 10). The conveyor type of cleaner, as shown in Fig. 1, has an apron which lies in the gutter at all times except during the cleaning operation. All the manure is moved out at once. The drag type uses a scoop operated by a drag cable and removes the manure from the gutter behind three to six cows at one time, see Fig. 7.

THE CONVEYOR TYPE OF CLEANER

A typical conveyor type of cleaner is in use on the Harold Pierce farm near Coldwater, Michigan. This cleaner was manufactured by a

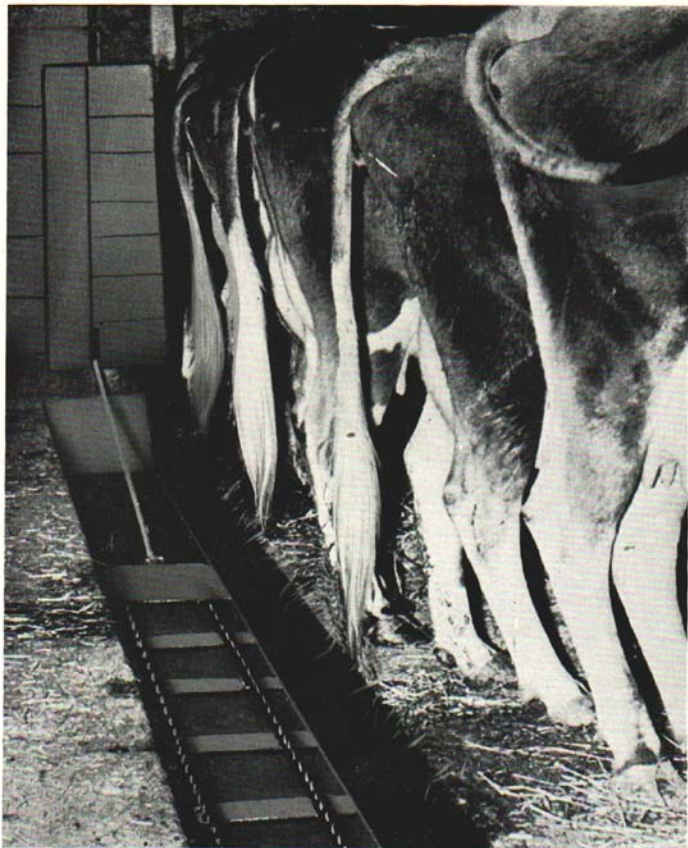
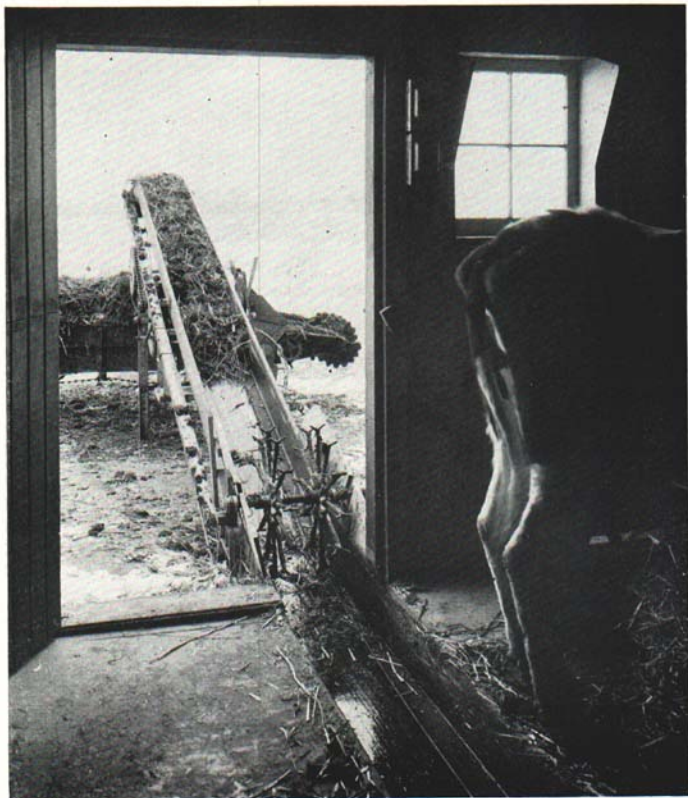


Fig. 1. The conveyor apron on the Lehman farm in Arenac County showing the iron cleats and $\frac{3}{8}$ " log chains. Short pieces of angle iron or iron fence posts make excellent cleats when fastened to the chain every 2 feet.

barn equipment manufacturer in Wisconsin. As shown on the cover page, a one and one-half horsepower motor pulls the apron and manure out and, as shown in Fig. 4, a one-fourth horsepower returns the apron to the gutter.

Conveyor Aprons

Conveyor aprons are made of several materials. The Pierce cleaner used two one-half inch cables which last about two years. If second-hand passenger elevator cable is available at a reasonable cost, this is satisfactory. Log chain, as used on the apron pictured in Fig. 1, can be expected to last from 7 to 8 years. Link belt or link sprocket chain with K 1 attachment links is giving satisfactory service on one cleaner in Arenac County.



(Photo courtesy, Detroit Edison Company)

Fig. 2. On steeper inclines, such as the one at the Davis Brothers farm in Lapeer County, a spider wheel is required to hold the conveyor down.



(Photo courtesy, Detroit Edison Company)

Fig. 3. The gutter cleaner on the Davis Brothers farm in Lapeer County. The apron drum, motor, and reduction mechanism are located under the inclined trough.

Power Required

The power required is determined by the length of the barn and the speed at which the cleaner is operated. The Pierce cleaner operates with a one and one-half horsepower motor in an 80-foot barn at the average rate of about 32 feet per minute. A cleaner on the Davis Bros. farm in Lapeer County operates with a two horsepower motor in a 90-foot barn at the average rate of 30 feet per minute. A cleaner on the 40-foot gutter of the Roy Wisner farm near Twining operates at the average rate of 6 feet per minute with a one-third horsepower motor. The speeds given are average speeds, and the speed at the beginning will be approximately one-half the average speed, owing to the fact that the effective size of the apron drum increases as cleaning proceeds.

Speed Reduction Units

Sprockets and chains, gears, or belts and pulleys may be used for speed reduction. V-belts are usually satisfactory only on the primary drive from the motor as they are designed for high speeds and low tensions. Automobile transmissions and differentials are effective in obtaining a speed reduction. Geerlings' cleaner was built from an

old mower frame. The drive was made from the power unit to the pitman wheel and the axle of the mower was used for the apron drum.

The speed reduction required varies considerably depending upon the size of motor and apron drum, and the length of the apron. However, the usual total speed reduction from a 1750 rpm. motor shaft to the drum shaft is about 175 or 200 to 1.

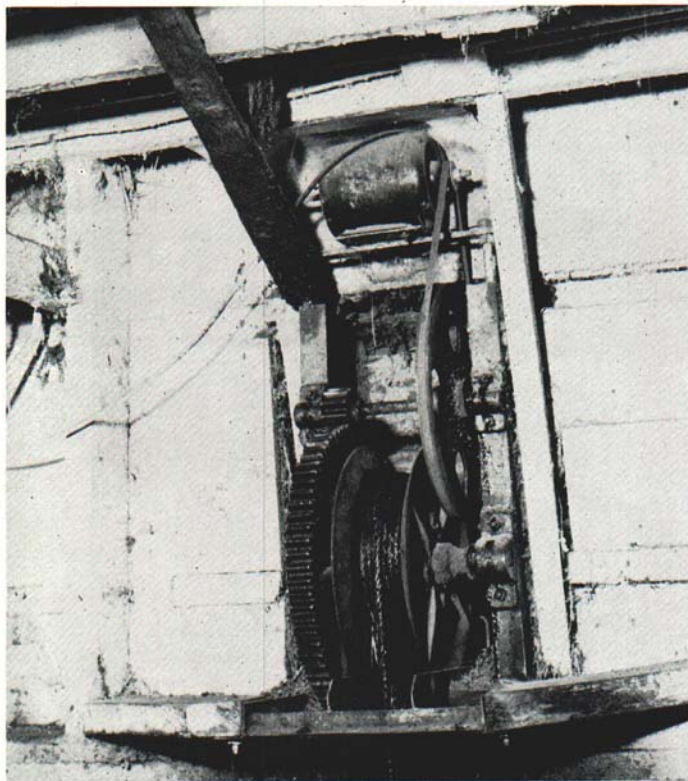


Fig. 4. The one-fourth horsepower motor returns the conveyor to the gutter.



Fig. 5. A grate used over the gutter at a crosswalk to permit the gutter and conveyor to continue straight through the barn.



Fig. 6. On barns where the gutter cleaner must be installed in the same end of the barn as the hay barn door, the gutter may be extended 14 to 16 feet to permit a drive near the end of the barn. This picture shows the installation on the Dale Woolcott farm in Van Buren County.

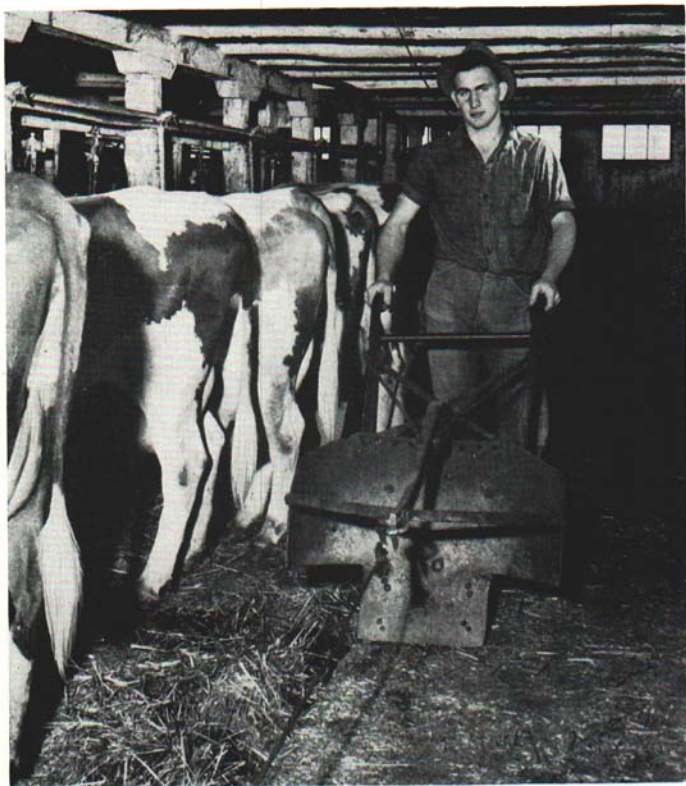


Fig. 7. The scoop used on the Hansen farm in Mason County on their drag type of cleaner. The scoop is carried by two small wheels for returning by hand.

The Apron Drum

The apron drum is a spool to wind up the conveyor at the end of the gutter. As illustrated in Fig. 3, it is commonly located under the inclined trough which elevates the manure to the spreader. The sides of the apron drum must be large enough to allow space to wind up the entire apron. The size of the core will depend on the material used for the conveyor. A log chain will wrap on a shaft or pipe $1\frac{1}{2}$ " or 2" in diameter; link chain on a 3" or 4" pipe and cable on a 6" or 8" drum.

DRAG TYPE OF CLEANER

The drag type of cleaner, Fig. 7, has the advantage that no conveyor or apron remains in the gutter to be deteriorated by the action of the manure. It is less convenient to operate and requires as large a motor as the other type of cleaner. The manure is removed with a



Fig. 8. A slight incline at the end of the gutter raises the manure high enough to drop directly into the spreader on the Hansen farm.

scoop from behind only three to six cows at a time, and also requires an operator. It must operate at a higher speed to make it practical from a labor-saving standpoint.

The cleaner on the C. E. Hansen farm at Scottville, uses a two horsepower motor to operate the drag scoop at a walking speed of about 176 feet per minute. The mechanism is controlled by overhead rope which operates a friction clutch. A similar cleaner on the Eugene Livingston farm at Caro uses a relay switch on the motor for operating the scoop.

INSTALLATION IN BARNES WITH DOUBLE GUTTERS

Most of the dairy barns in Michigan have a double row of stalls. The installation in this type of barn is more expensive than in barns with a single row of stalls. The cost can be reduced by using a line shaft to permit the use of the same power unit and speed reduction unit for both conveyors, see Fig. 10. A clutch on each unit will be necessary for individual control. On barns where the stalls face in, the line shaft could be mounted on the end of the barn above the doors and windows and a link-chain drive to the drums under the conveyor. The motor and reduction unit can then be mounted inside the barn for protection from the weather.



Fig. 9. The spreader is housed in a ramp at one end of the barn ready for use. The ends of the gutters extend out from the wall on the right-hand side.

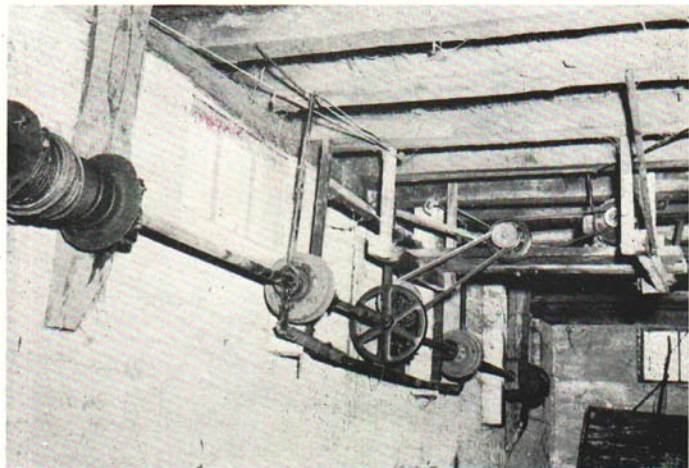


Fig. 10. The drive mechanism on the Hansen cleaner, showing the 2-horsepower motor on the right-hand side of the picture and the drum and cable on the left-hand side. A drum for the other gutter is located in the background. A clutch on each drum is operated by a rope extended overhead the length of each gutter.

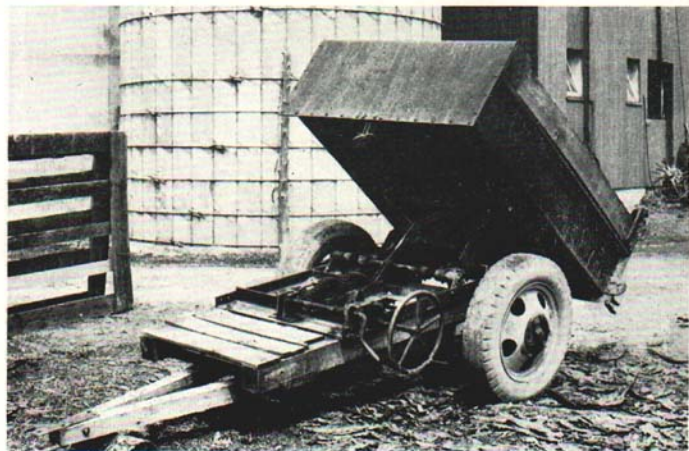


Fig. 11. A dump trailer used on the Davis Brothers farm, Lapeer, during unfavorable weather to dispose of manure when it is impossible to use manure spreader.