

W. K. LIGGETT.
 COMBINED CRUSHER AND PULVERIZER.
 APPLICATION FILED APR. 11, 1914.

1,321,380.

Patented Nov. 11, 1919.
 2 SHEETS—SHEET 1.

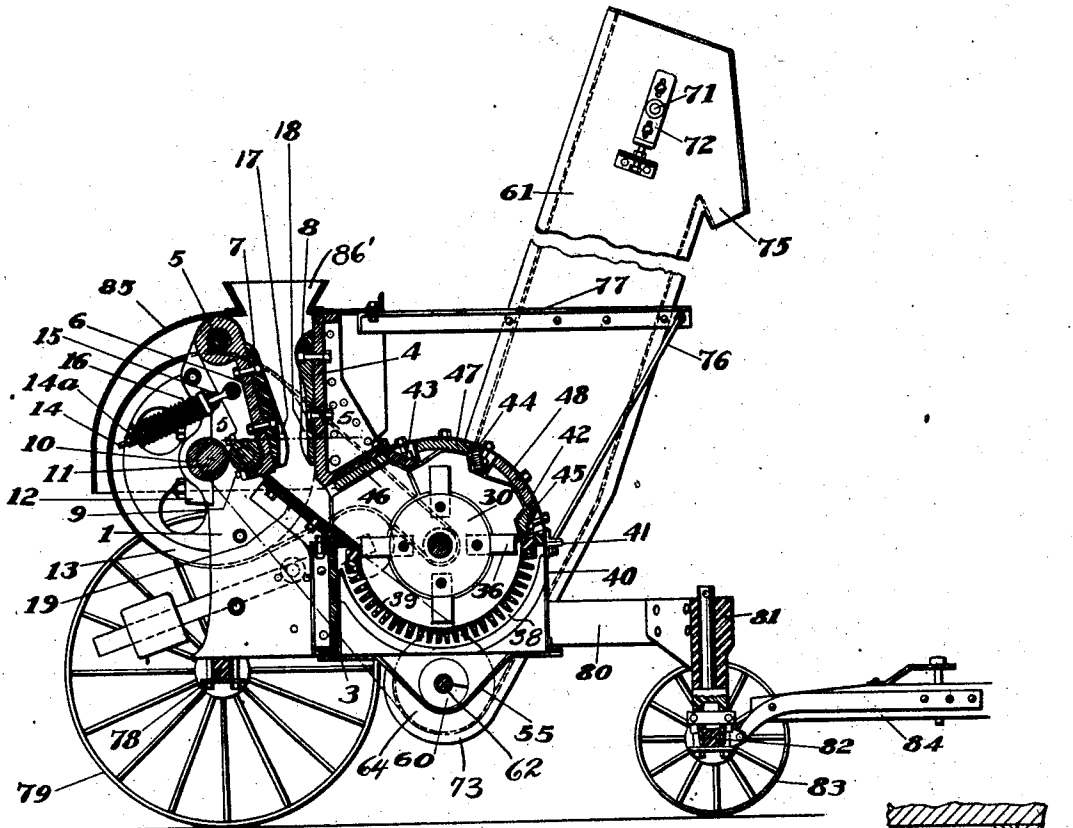


Fig. 1.

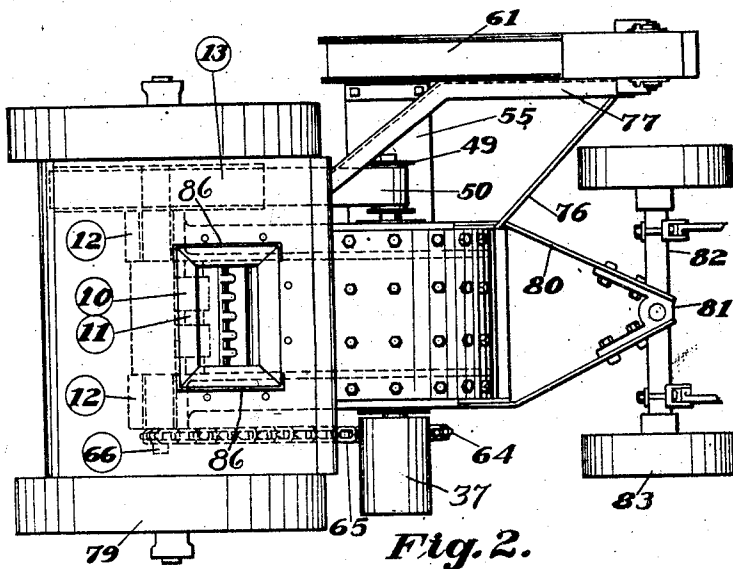


Fig. 2.

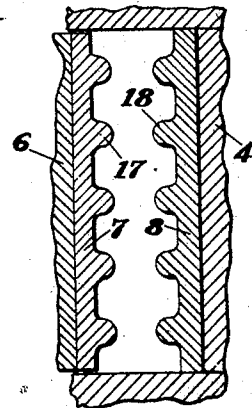


Fig. 5.

WITNESSES:

N. H. Lybrand
S. Jay Teller

INVENTOR,
William K. Liggett
 BY *H. Stollers*
 ATTORNEY.

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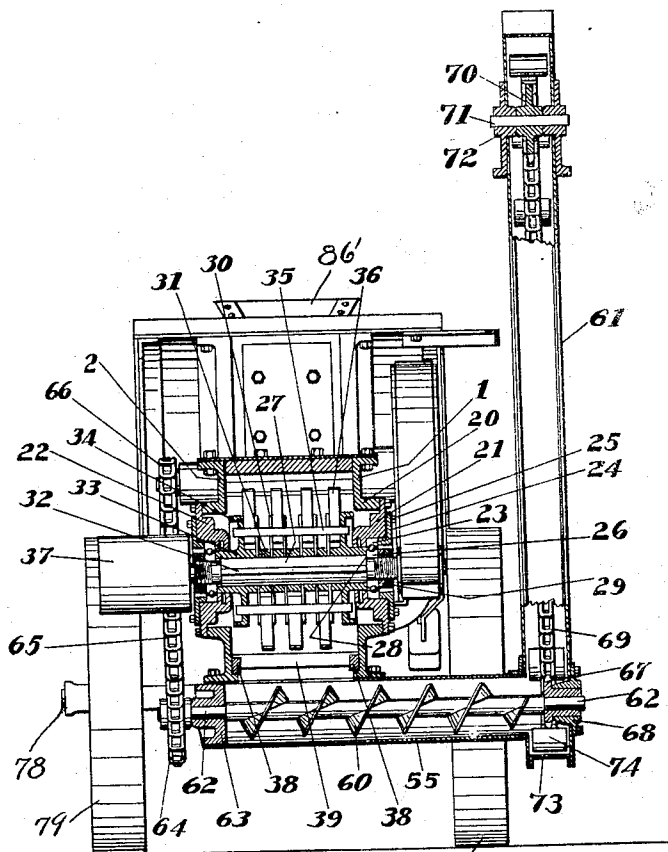


Fig. 3.

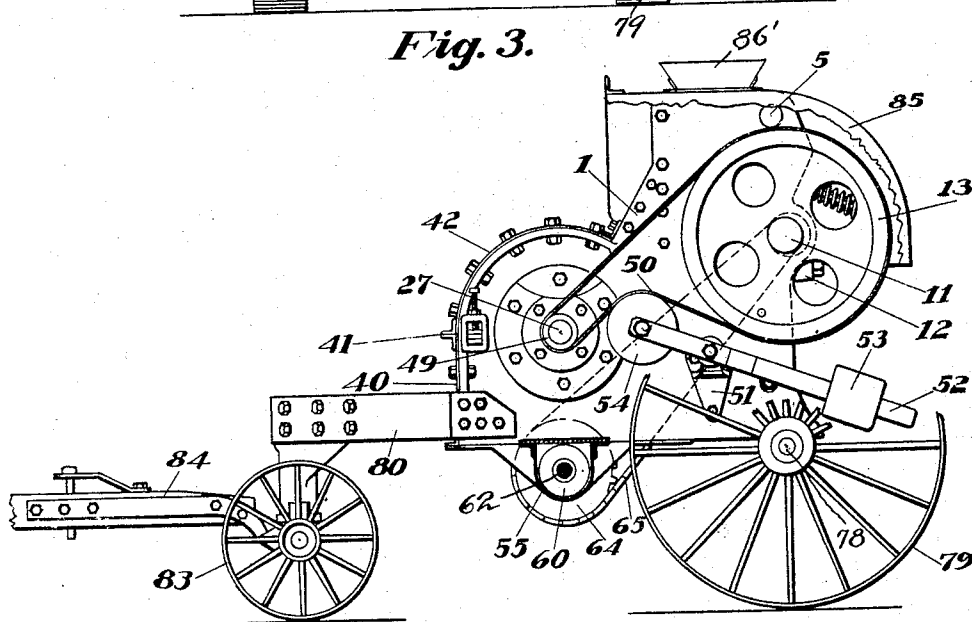


Fig. 4.

WITNESSES:

H. N. Lybrand
S. Jay Teller

INVENTOR.
William K. Liggett
 BY *H. N. Lybrand*
 ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM K. LIGGETT, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

COMBINED CRUSHER AND PULVERIZER.

1,321,380.

Specification of Letters Patent. Patented Nov. 11, 1919.

Application filed April 11, 1914. Serial No. 831,200.

To all whom it may concern:

Be it known that I, WILLIAM K. LIGGETT, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Combined Crushers and Pulverizers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in portable pulverizing and crushing apparatus, particularly mechanisms that can be employed by farmers for either of various purposes, such as pulverizing masses of material which do not require preliminary breakage or crushing, and also reducing hard rock pieces to smaller ones, and, at option, producing from such rock pieces a pulverulent mass.

Prior to my invention heavy cumbersome crushing machines have been provided, some mounted on wheels, and others designed to be fastened stationarily in position. They have been made heavy and cumbersome because of their being designed for severe work requiring the application of great power.

The object of the present invention is to provide a strong but light and readily portable mechanism comprising a pulverizer whose operating elements perform their work at high speed. In order to be readily portable from place to place about a farm or over uneven surfaces of ground the machine is made compact, but has its working parts so distributed that the strains and stresses are taken up by the more firmly supported frame elements, so that the interior parts can be readily reached for repairing or replacing without disassembling the entire mechanism.

My improved reducing apparatus is shown in the accompanying drawings, in which:

Figure 1 is a vertical longitudinal section of the machine;

Fig. 2 is a general plan view of the machine shown in Fig. 1;

Fig. 3 is a vertical transverse section along the center line of the pulverizing shaft;

Fig. 4 is a side elevation of the machine, certain parts being broken away;

Fig. 5 is a fragmentary sectional view along the line 5—5 of Fig. 1.

Like numerals refer to similar parts in the several figures.

Referring to the drawings, the main frame

of the vehicle comprises the framework of the pulverizing and crushing apparatus. The pulverizer has two side plates 1 and 2 joined by the cross members 3 and 4 bolted thereto. The vehicle has rear wheels 79 on the ends of an axle 78. It also has a front truck having the wheels 83 on the swiveling axle 82 to which is connected the pole 84. The said frame bars or plates of the pulverizer are bolted directly to the rear axle 78, and extend forward to transverse lines as near as practicable to the front supporting and steering wheels 83.

The framework between the two axles (mainly consisting of the pulverizer frame as set forth) is connected to the front axle by short sill bars 80, the rear ends of which are bolted to the front lower corners of the pulverizer plates 1, 2. These bars 80 converge toward a pivot axis and are secured to a vertical bearing 81 that receives the central upright pivot of the front axle.

I employ a rapidly rotating pulverizing apparatus of a diameter as large as is practicable, and arrange it as close to the ground as possible to have its axis of rotation near the ground base and so that the torsional action on the frame and the vehicle (from its rapid movements) will result in a minimum of wear and distortion of parts.

I have devised a special hammer pulverizer particularly adapted for use in the present mechanism.

The end frame plates 1 and 2 are cast with large central apertures and with outwardly extending flanges 20. The rotor consists of the shaft 27, with the key 32, the hammers 36, the end disks 34, with hubs 33, the intermediate disks 30, the spacers 31, the pivot rods 35, the clamping nuts 29, the power receiving pulley 37 and the power transmitting pulley 49. These parts are so constructed and relatively positioned that they can be assembled and the assembly, as an entirety, can be passed through the large central aperture in the frame plate 2 and across the pulverizer chamber.

At the ends of the shaft are the bearing plates or housing disks 21 and 22. They are secured to the flanges 20 and are shaped in such way as to turn inward a short distance. In each of these bearing or housing plates there are rings 23 and 26, with bearing balls between them.

When putting the rotor in position the

bearing plate 21 can be allowed to remain, the bolts for plate 22 being taken out, as are also those at 25, for the binding and closing plates 24. Nuts 29 hold in place the inner ball ring. The end disks 34 are of a diameter such that they can pass through the openings in the end frame. The hammers, although shown radially extended, can be folded toward the shaft when not rotating so as to lie within the circle of the hammer disks 34. The shaft is shouldered at 28 to take the end thrust of the inner ball ring. The thrust of the outer ball rings 23 is taken by the in-turned flanges on the bearing or housing plates 21, 22.

This part of the apparatus includes also the screen bars or grating 39 supported in the ring segments 38.

The front part of the pulverizing housing consists of a plate 40 which extends up to approximately the horizontal plane of the rotor. The cover consists of the sheet or curved plate 42 which is secured to the lower vertical wall 40 by the flanges at 41. Inside of the cover are placed angularly arranged breaker plates 43, 44, and 45 with the intermediate plates 46, 47, and 49.

I do not herein claim specifically any of the detailed features of improvement in the pulverizer mechanism just described, separately considered. But having found that any rapidly rotating pulverizers of earlier styles known to me were not suitable for the mechanism (as an entirety) that I have herein shown, I was led to design this part of the apparatus with special relation to the others which are set forth.

The power for driving the apparatus is initially taken to the rotor shaft 32. From that, although rotating at high speed, it is transmitted to the preliminary crushing apparatus. The latter is also supported on the main frame elements 1 and 2 of the vehicle and of the pulverizer which, at their rear parts, are extended upward to relatively high lines. And the strong cross bracing frame plate 4 is bolted to these upwardly extending projections. To the rear face of this frame element 4 is secured a stationary crushing jaw 8, with ribs 18. In the rear, and on the shaft 5, is hinged the reciprocating plate 6 with jaw 7, having ribs 17. This jaw is reciprocated by the shaft 11 in bearings 12 and provided with an eccentric 10, which bears against the roller at 9 carried by the swinging jaw. These parts, to wit, the shaft 11, the roller 9, and the shaft 5, are all mounted directly above the rear axle, so that the strains and stresses exerted when at work are taken by the most firmly supported part of the mechanism. The swinging jaw is returned outward and held with its roller against the eccentric 10 by means of a spring 16 on a rod 14 pivoted at 15 to the jaw, the tension of the spring being

maintained and regulated by nuts at 14^a. The shaft 11, for driving the crusher jaw, is actuated directly from the pulverizer shaft 32 by means of the belt 50 driven from the small pulley 49 and engaging with the large fly wheel 13 on shaft 11. The belt 50 is kept tight by the lever 52 pivoted on bracket 51, and carrying the pulley 54 and the weight 53.

A feeding and inclosing device is provided having the rear upwardly curved shield 85, the side plates 86 and the hopper 86'; the latter being situated directly above the chamber between the crusher jaws.

This chamber delivers material from the crusher to an inclined chute 19, which in turn delivers it to the hammers of the pulverizer. But there are many materials which, upon farms, it is desirable to reduce or comminute which do not require a crushing like that performed by the jaws at 7, 8, such as different forms of stock feed and materials to be delivered to the ground as fertilizers, or the like, such as straw, stalks, leaves, etc. Such materials as do not require crushing, but should be finely cut up or pulverized, can be delivered directly to the pulverizer chamber and successfully treated, the belt at 50 at such times being removed and the crusher jaws merely acting as the walls of the chuteway.

Supported on the pulverizer frame and below it there is a cross conveyer 60 mounted in a trough or box 55. Its shaft is indicated by 62, which is mounted in bearings, 63, 68. This shaft is rotated by wheel 64 and the chain 65 driven by sprocket 66 on the crusher shaft 11. It delivers to the boot 73 of an elevator having buckets 74 mounted in an elevator tube 61. The shaft 62 of the cross conveyer carries a sprocket wheel 67 in a bearing 68, the chain 69 from the lower sprocket passing, at the top, around a sprocket 70 on shaft 71 mounted in adjustable bearings 72. The elevated material is delivered from the buckets through a discharge orifice at 75.

The elevator structure is disposed in such manner as to incline forward slightly in order to have it assist in holding steady and balancing the apparatus as an entirety and notwithstanding the violent movements to which it is subjected by the rapid rotations of the pulverizer and the reciprocation of the crusher.

It is rigidly held in predetermined position by means of the bracket bar 77 which is bolted to the upper part of the framework of the crusher and the stay rod 76 which engages with the holder or brace 77 and is secured to the front end of the pulverizer frame, as shown.

The rapidly revolving rotor shaft and the jaw actuating shaft are close together, and, although driven by a short belt connec-

tion, it frictionally engages with the pulleys and the drive connection is of a yielding character, so that notwithstanding the variations in loads upon the two main elements of the mechanism, one will not interfere with the other through variations in inertia.

What I claim is:

1. In a portable reducing apparatus, the combination with the pulverizer having in its interior a rapidly revolving rotor comprising a shaft with swinging hammer bars and a framework with end plates 1, 2 for the support of said rapidly revolving rotor, of the axle carrying the rear wheels and secured directly to the pulverizer frame parts, the front wheeled truck, the short sill bars bolted to the pulverizer frame plates and hinged to the truck, the jaw crusher having a hinged reciprocating jaw mounted in planes above those of the pulverizer, the driving shaft for the reciprocating jaw, said shaft and the hinge of said jaw being both positioned directly above the rear axle, the cross conveyer supported on the pulverizer frame below the pulverizer and arranged to take the material therefrom on transverse lines, and the elevator receiving material from the cross conveyer and inclined upward and forward, all of said parts being arranged as set forth to provide a short wheelbase, with the operative parts immediately above the ground supports.

2. In a portable reducing apparatus, the combination with the pulverizer having in its interior a rapidly revolving rotor comprising a shaft with swinging hammer bars and disks for the bars, a framework with end plates 1, 2 for the support of said rapidly revolving rotor and formed with enlarged central openings adapted to have the rotor with its attachments passed endwise transversely therethrough for mounting and dis-

mounting the rotor, of the axle carrying the rear wheels and supporting the pulverizer frame parts, the front wheeled truck, the sill bars secured to the pulverizer frame plates and hinged to the truck, the jaw crusher having a hinged reciprocating jaw in planes above those of the pulverizer, the driving shaft for the reciprocating jaw, the prime power receiving device on the rotor shaft, and the power transmitting devices between the rotor shaft and the jaw actuating shaft, substantially as described.

3. In a portable reducing apparatus, the combination with the pulverizer having in its interior a rapidly revolving rotor comprising a shaft with swinging hammer bars, and a framework with end plates 1, 2 for the support of said rapidly revolving rotor, of the axle carrying the rear wheels and arranged to support the pulverizer, the front wheeled truck, said truck and rear axle being arranged to provide a short wheel base, the jaw crusher having a hinged reciprocating jaw in planes above those of the pulverizer, the driving shaft for the reciprocating jaw, said shaft and the hinge of said jaw being both positioned directly above the rear axle, the prime power receiver on the rapidly revolving rotor shaft, the driving pulley on the rotor shaft, the driven pulley on the reciprocating jaw shaft, and the relatively short belt frictionally engaging the said pulleys for transmitting power from the rapidly revolving rotor shaft to the jaw shaft, substantially as described.

In testimony whereof, I affix my signature in presence of two witnesses.

WILLIAM K. LIGGETT.

Witnesses:

T. E. MILLER,
DUDLEY T. FISHER.