Sept. 26, 1939. W. M. McKEEVER 2,174,471

CRUSHING AND GRINDING MILL

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Fig. 1.

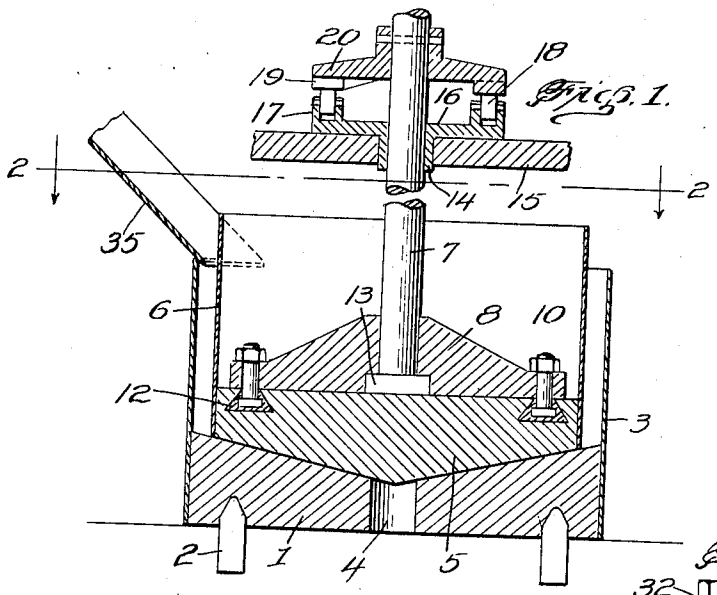



Fig. 3.

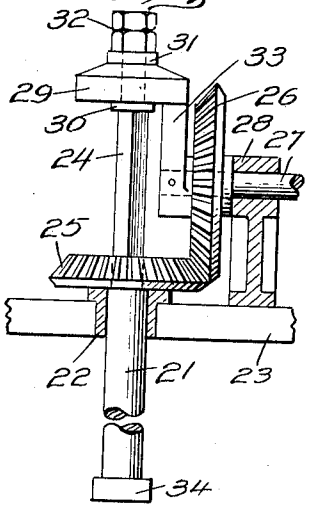
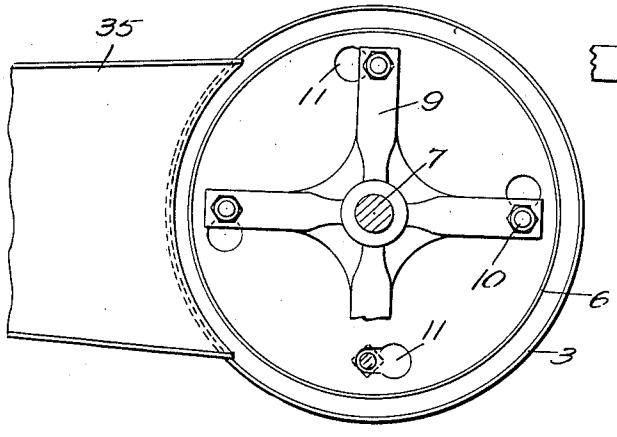



Fig. 2.




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## CRUSHING AND GRINDING MILL

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Application September 6, 1938, Serial No. 228,696

1 Claim. (Cl. 83—10)

This invention relates to crushing and grinding mills, and its general object is to provide a mill for pulverizing ore, rock and the like, that is capable of maximum production with minimum use of power, due to a simultaneous reciprocatory crushing and rotary grinding action, coupled with means to provide a continuous flow of material through the mill, which results in eliminating what may be termed "clod resistance" and "over grind waste", and as both of those detrimental features are present in mills of this character now in general use, such mills require a greater operating power and expense, with less production than the mill which forms the subject matter of the present invention.

A further object is to provide a mill that includes companion crushing and grinding elements, or in other words a mortar and muller therefor, that are detachably mounted, so that they may be readily replaced in the event of damage thereto.

A still further object is to provide a grinding and crushing mill that is simple in construction, inexpensive to manufacture, easy to install, and extremely efficient in operation, use and service.

This invention also consists in certain other features of construction and in the combination and arrangement of the several parts, to be hereinafter fully described, illustrated in the accompanying drawing and specifically pointed out in the appended claim.

In describing the invention in detail, reference will be had to the accompanying drawing wherein like characters denote like or corresponding parts throughout the several views, and in which:

Figure 1 is a vertical sectional view taken through the mill which forms the subject matter of the present invention, and illustrates one form of reciprocating means for the muller.

Figure 2 is a sectional view taken approximately on line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is a view of a modified form of reciprocating and drive means for the muller.

Referring to the drawing in detail, the reference numeral 1 indicates the mortar of my mill which is preferably of flat cylindrical formation, as shown, and in any event is provided with a plurality of recesses extending into the bottom thereof to fittingly receive mounting studs 2, the latter being fixed in and rising from a base not shown, which is preferably concrete, but of course the base can be of any material suitable for the purpose.

Surrounding the mortar and secured thereto, as well as rising a considerable distance above the upper surface thereof is a drum 3 that acts as a receptacle for receiving rock, ore or the like, and the mortar has a conical cavity in the upper face thereof, that extends from its outer edge toward its center, it being obvious that the upper face provides a working surface, and an opening 4 in the form of a bore extends through the center to provide outlet means, as will be apparent upon inspection of Figure 1.

The muller includes a body or shoe 5 having a conical lower working face for fitting association with the working face of the mortar and the body 5 is of less diameter than the mortar, but likewise has surrounding the same and secured thereto, as well as rising therefrom a drum 6, which extends above the upper end of the drum 3, and the drums cooperate to provide a feeding space between the same.

The muller has a shaft 7 detachably connected thereto, through the instrumentality of a spider 8 that includes arms 9 provided with openings in the ends thereof to receive bolts of bolt and nut connections 10, the bolts having their heads mounted in bayonet slots 11 disposed in the body or shoe 5 and held accordingly by Babbitt metal 12. The reduced portions of the slots 11 are preferably wedge shape as shown in Figure 1, while the remaining portions are rounded and are of a size to allow free insertion and removal of the heads with respect to the slots, as will be apparent upon inspection of Figures 1 and 2. The shaft 7 is provided with a head 13 received in a recess in the lower surface of the spider which is centrally enlarged, and has the arms 9 connected to the centrally enlarged portion by webs, as best shown in Figure 2.

In Figure 1 I have illustrated one form of reciprocating means for the muller which includes a bushing guide 14 for the shaft 7 mounted in suitable supporting means 15 and the bushing has formed thereon a disk member 16 having bearing members 17 rising therefrom to receive the trunnions of rollers 18, upon which are mounted cam members 19 of a disk plate 20 that is fixed to the shaft 7. By that construction, it will be obvious that the muller is reciprocated during the rotation thereof, and the shaft 7 has connected thereto any suitable power means, for rotating the same.

In Figure 3, I have illustrated a combined rotary drive and reciprocating means for the shaft of the muller, and which in this instance is indicated by the reference numeral 21, the shaft

being mounted in the bushing 22 that is likewise provided with suitable supporting means 23, and the shaft includes a square cornered portion 24 for slidable movement through a beveled gear 25 which is held seated on the bushing 22 by a companion gear 26, in that the gear 26 is fixed to the drive shaft 27 which is journaled in the bracket 28 secured to and rising from the supporting means 23.

Floating or rotatably mounted on the upper end portion of the shaft 21, is an abutment disk 29 that is held thereon accordingly between collars 30 and 31, by lock nuts 32, for disposal in the path of an accentric cam member 33 which is fixed on the end of the drive shaft 25, consequently it will be obvious that the shaft 21 is not only rotated through the instrumentality of the bevel gears 25 and 26, but is reciprocated by the cam member 33 and abutment disk 29. The shaft 21 is also provided with a head 34, for receiving the muller in the same manner, as shown in Figure 1.

In order to supply material to the mill, to be ground thereby I provide a trough 35 that is preferably of the channel type, as best shown in Figure 2, and rests upon the upper edge of the drum 3 for directing the material between the drums, as will be obvious upon inspection of Figure 1, so that the material will fall by gravity upon the conical working surface of the mortar and thence be disposed between that face and the working face of the muller, to be crushed and ground, as it is being fed to the outlet opening 4. It will be further obvious that the base is provided with outlet means to register with the opening 4. By providing the outlet opening in the center of the mortar, it will be seen that the pulverized material will freely pass from the mill, and that feature coupled with the simultaneous reciprocatory and rotary action of the muller will eliminate the so-called "clod resistance", as well as "over grind waste" as previously set forth, and thereby bring about maximum production with the use of minimum power.

While it has been stated that any suitable power means may be employed for rotating the shaft 7, for cooperation with the reciprocating means of Figure 1, it will be obvious that the gear means of Figure 3 and the drive shaft 27 may be used for that purpose.

It is thought from the foregoing description that the advantages and novel features of the invention will be readily apparent.

It is to be understood that changes may be made in the construction and in the combination and arrangement of the several parts, provided that such changes fall within the scope of the appended claim.

What I claim is:

A mill comprising a mortar having an outlet opening extending centrally therethrough, a muller mounted for rotary and reciprocatory movements with respect to the mortar for cooperation therewith, a mortar engaging shoe included in the muller and having bayonet slots therein, a spider included in the muller and having arms, bolt and nut connections for securing the shoe to the arms, soft metallic means for securing the bolts of the bolt and nut connections in the bayonet slots, a shaft for the muller and detachably connected thereto by the spider, drums secured to and surrounding the mortar and muller and rising vertically therefrom in spaced relation with respect to each other to provide an annular feeding space therebetween, and means for rotating and reciprocating the muller.

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