

No. 682,157.

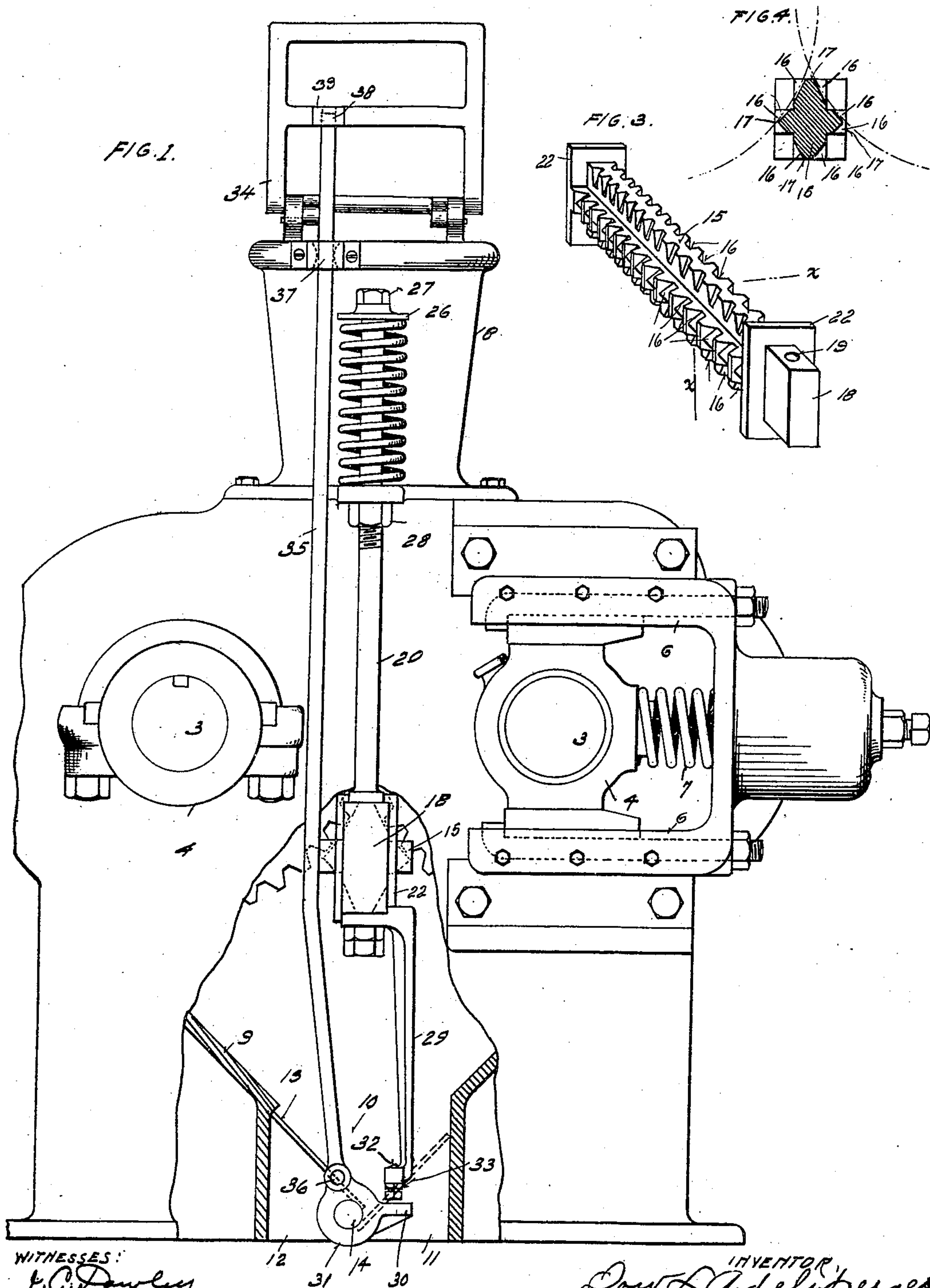
Patented Sept. 10, 1901.

D. L. ADELSPERGER.  
GRINDING OR CRUSHING MILL.

(Application filed Apr. 11, 1901.)

(No Model.)

3 Sheets—Sheet 1.



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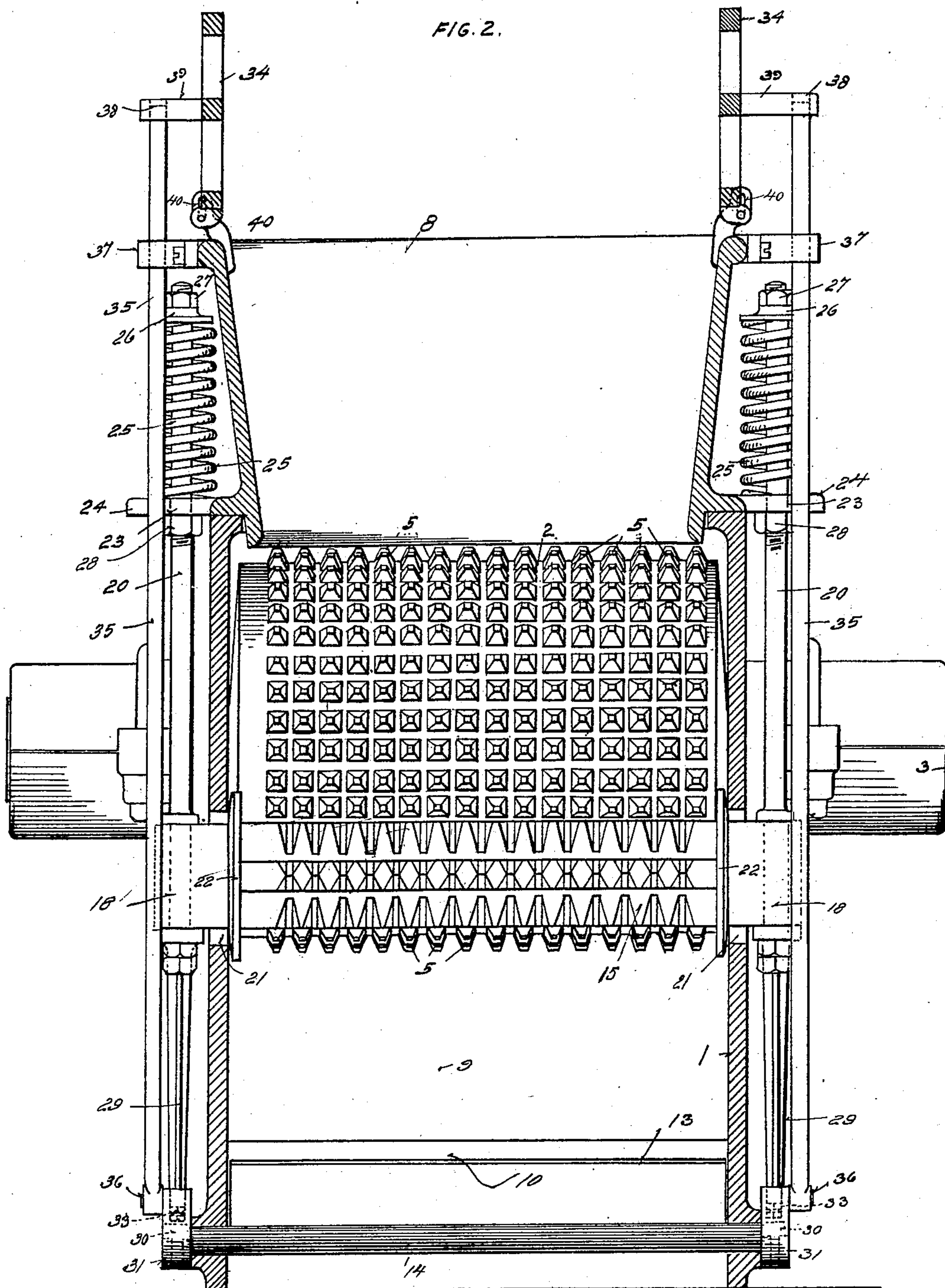
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3 Sheets—Sheet 2.



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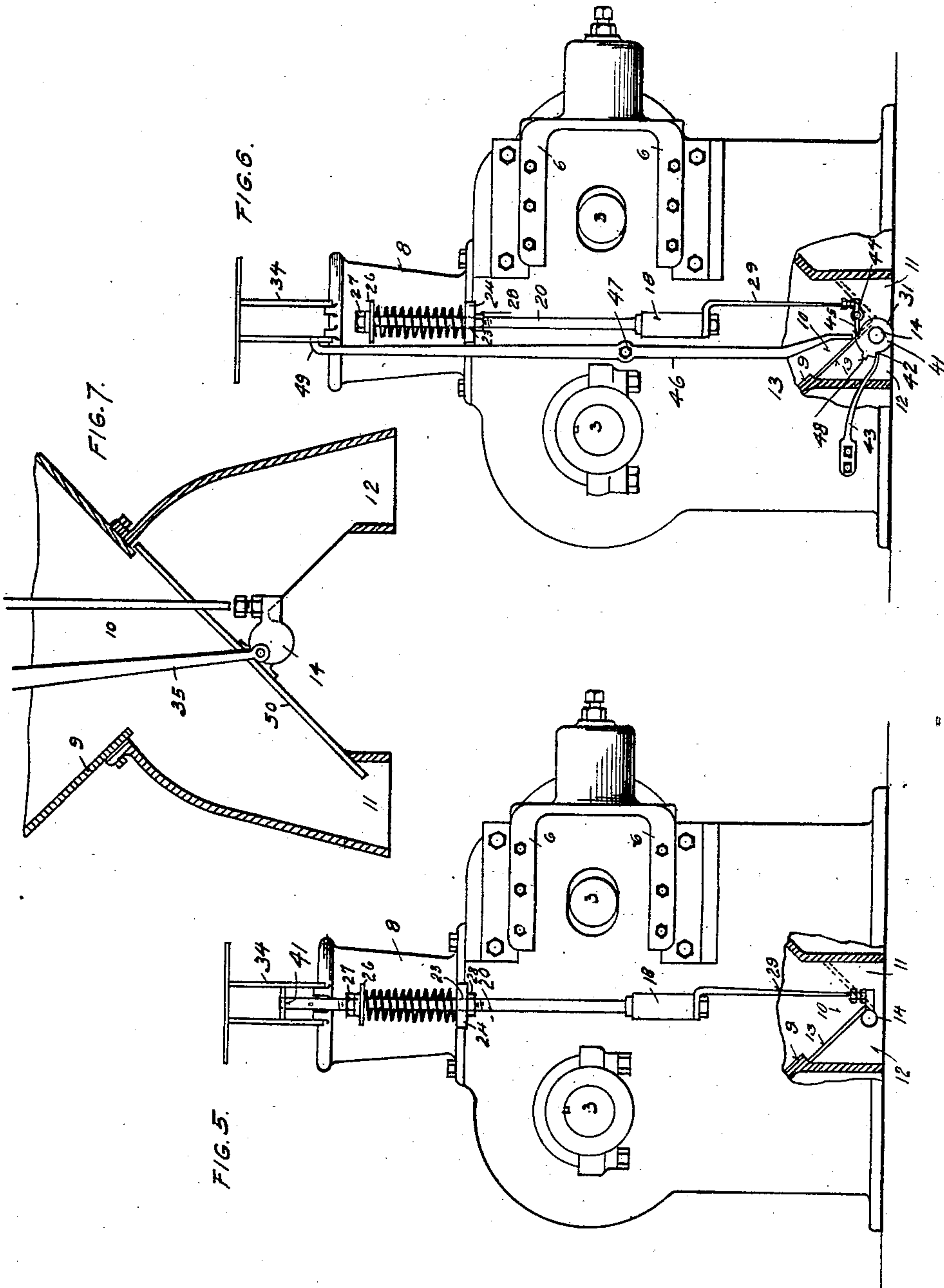
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3 Sheets—Sheet 3.



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# UNITED STATES PATENT OFFICE.

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## GRINDING OR CRUSHING MILL.

SPECIFICATION forming part of Letters Patent No. 682,157, dated September 10, 1901.

Application filed April 11, 1901. Serial No. 55,278. (No model.)

*To all whom it may concern:*

Be it known that I, DOW L. ADELSPERGER, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Grinding or Crushing Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to grinding and crushing mills, and has for its object to provide a construction whereby in case of the passage of any hard foreign substance through the mill said substance will be diverted from the ordinary path of discharge of the product of the mill, so that the normal product will be uniform and free from such hard substances.

20 The present invention is more particularly devised for use in connection with crushing-mills such as are employed for crushing oil-cake as a preliminary step to its further reduction by means of attrition-mills or other grinding-mills. In crushing oil-cake for this purpose it sometimes occurs that hard substances—such as nuts, bolts, or other pieces of iron—are present in the cake and are not discovered until the cake has passed through the crusher, and sometimes not even then.

30 Such crushers are now usually so constructed as to avoid breakage by the passage of such obstacles; but when the hard foreign bodies pass through the crusher they become mingled with the output thereof, and even if their passage is discovered it is a matter of considerable difficulty and loss of time to remove them prior to the delivery of the output to the attrition or grinding mill.

40 More specifically my present invention in its preferred form has for its object to divert the product or output of the crusher upon the passage of such a hard foreign body through the same, so that this portion of the product will be discharged at a different point from the normal discharge, such action occurring automatically and insuring that the output at the normal point of discharge shall be free from substances dangerous to the grinding or attrition mills, by means of which

50 it is subsequently treated.

To these and other ends my invention consists in certain novel features which I will now proceed to describe and will then specifically point out in the claims.

In the accompanying drawings, Figure 1 is 55 a side elevation, partly in section, of a construction embodying my invention in one form. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a perspective view of the yielding bar detached. Fig. 4 is a trans- 60 verse sectional view of the same, taken on the line  $x x$  of Fig. 3. Fig. 5 is a view similar to Fig. 1, illustrating a modified form of the apparatus. Fig. 6 is a similar view illustrating another modification, and Fig. 7 is a 65 detail sectional view illustrating a modified form of valve.

In said drawings I have shown my invention as applied to a well-known form of crushing apparatus, comprising a suitable frame 70 or casing 1, in which are mounted two crushing-rolls 2, carried by shafts 3, mounted in bearings 4. These rolls are shown as provided with teeth 5, which overlap or pass each other in the manner indicated in Fig. 4, the 75 rolls being driven in opposite directions and at different speeds by any suitable means—as, for example, independent driving pulleys and belts. The bearings of one of the rolls are adapted to slide in ways 6, backed by 80 springs 7, so that said roll is adapted to yield away from the other roll in case any hard object of sufficient size passes between the rolls, thereby preventing breakage thereof. This apparatus is provided at the top with a 85 receiving-hopper 8 and at the bottom below the rolls with a discharge-hopper 9. It will be understood, of course, that this particular type of machine is chosen for purposes of illustration only, and the details of construction just described may be varied. 90

The hopper 9 is provided with an outlet-mouth 10 at its bottom, which communicates with a normal discharge-opening 11 and an emergency discharge-opening 12. The mouth 95 10 is controlled by a switch-valve 13, mounted on a shaft 14 and adapted when in its normal position (shown in full lines in Fig. 1) to cause the product from the crushing-rolls to pass from the hopper 9 into the normal dis- 100



charge-outlet 11. When this switch-valve is turned, however, into its second or emergency position, which is indicated in dotted lines in Fig. 1, the product from the rolls is diverted  
 5 into the emergency discharge-outlet 12. This switch-valve is operated by means of suitable intervening mechanism from a yielding bar 15, which bar is located immediately below the crushing-rolls parallel with their axes of  
 10 revolution and is provided in the case of rolls having teeth, as shown, with notches 16, through which said teeth pass without contact with said bar. In the particular construction of bar shown the body portion there-  
 15 of is provided with vertical and horizontally projecting ribs 17, each having notches 16 at both of its angular edges, and the bar is thus reversible by reason of the fact that when the uppermost portion thereof becomes worn  
 20 the lowermost portion may be turned upward to form a working surface to cooperate with the crushing-rolls. As hereinbefore stated, this bar is a yielding bar, and as a simple and efficient means for providing a yielding  
 25 support for said bar I provide at the ends thereof heads 18, apertured, as shown at 19, to receive supporting-rods 20, one at each side of the machine. The heads 18 extend through slots 21 in the frame or casing 1, and the bar  
 30 is provided with flanges or collars 22 at each end inside of the casing, as shown in Fig. 2. The supporting-rods 20 pass upward through apertures 23 in lugs 24, projecting from the frame, and each rod is supported by a coiled  
 35 spring 25, abutting against the upper side of the corresponding lug 24 and against a collar 26, backed by an adjusting-nut 27, mounted on the threaded upper end of the rod. Each rod is further provided with a nut 28, threaded  
 40 and adjustable on the rod 20, below the lug 24, and serving by its contact with said lug to limit the upward motion of the rod 20 and of the yielding bar carried thereby.

As a simple and effective operating mechanism between the yielding bar and the  
 45 switch-valve 13 I have shown in Figs. 1 and 2 said bar as being provided at each end with a downwardly-extending finger or plunger 29, in the path of which is arranged a corresponding lug 30, projecting from the shaft 14. Preferably each lug 30 extends outward from a collar 31 on the corresponding end of the shaft 14, and the finger or plunger 29 is provided with an adjustable tappet-bolt 32,  
 50 adapted to be secured by a lock-nut 33 after adjustment, the adjustment of said bolt serving to regulate the period of contact between the finger or plunger and the lug on the valve-shaft.

60 It will be observed that the two working positions of the switch-valve lie on opposite sides of a vertical plane, so that when said valve is moved beyond a vertical position in either direction it tends to fall to its normal  
 65 or emergency position, as the case may be. It will thus be seen that in case a hard sub-

stance of dangerous size is introduced into the apparatus it will pass down between the crushing-rolls, one of which yields if necessary, and will be engaged between the teeth  
 70 of one of said rolls and the yielding bar 15. As the roll continues to rotate such engagement will cause the yielding bar to move downward, this downward movement occurring either at one end or the other of the bar,  
 75 or at both ends if the obstacle is centrally located. Such downward movement of the bar will cause the plunger or finger 29 to strike against the lug 30 and rotate the shaft 14 to an extent sufficient to carry the switch-valve  
 80 from its normal position, as shown in full lines in Fig. 1, to a point beyond the vertical, whereupon the switch-valve will continue to move until it occupies its emergency position. (Shown in dotted lines in Fig. 1.) This  
 85 shifting of the valve will occur before the obstacle has had time to pass through the discharge-mouth 10 of the hopper 9, and said obstacle, along with a portion of the product of the crusher, will be diverted from the normal  
 90 discharge-outlet 11 into the emergency discharge-outlet 12. After the obstacle has passed the springs 25 will return the yielding bar to its normal position, and the switch-valve and its associated parts may also be re-  
 95 turned to their normal position either by hand or by suitable mechanism for the purpose. It will thus be seen that as long as the crusher encounters no obstacles the product is discharged through the normal discharge-outlet;  
 100 but immediately upon the passage through the rolls of a hard body of sufficient size the switch-valve is automatically thrown over, so as to insure the discharge of said body through the emergency-outlet, thereby preserving the  
 105 uniformity of the output through the normal discharge-outlet.

It may under certain circumstances be desirable to provide a visible signal to indicate the passage of an obstacle and even to provide  
 110 means to prevent the further feeding of oil-cake into the receiving-hopper through carelessness or oversight after the switch-valve has been so turned as to divert the product into the emergency-outlet. In case such  
 115 provision is deemed desirable I provide the receiving-hopper 8 with a gate or similar device 34, hinged to each end thereof and standing normally upright, as shown. The hinged connection is so located, as indicated in Fig. 120  
 2, that when the gates are released in the manner hereinafter set forth they will fall down and close or partially close the mouth of the receiving-hopper. In connection with  
 125 each gate is employed a rod 35, pivoted at its lower end, as indicated at 36, to an eccentric-pin on the collar 31 at the corresponding end of the shaft 14. The upper end of this rod 35 passes through a keeper or guide 37, the free extremity of the rod being adapted to  
 130 engage a recess 38 in an arm or projection 39 from the corresponding gate 34. It will



be observed that when the switch-valve 13 is in its normal position the pin 36 is near its uppermost position, and that when the switch-valve is thrown over in the manner hereinbefore described to close the normal outlet the pin 36 moves downward a distance sufficient to disengage the upper end of the rod 35 from the gate 34, allowing this latter to fall and partially close the mouth of the receiving-hopper. Not only does the fall of the gate or gates afford a visible signal indicating the shifting of the switch-valve, but either or both of the gates will so far close the mouth of the receiving-hopper as to prevent further insertion of oil-cake, through carelessness or inadvertence, while the switch-valve is in its shifted position. In order to permit the reengagement of the gates 34 with the upper ends of the rods 35 when these latter have been returned to their normal position, each gate-hinge is provided with a slot 40, allowing sufficient vertical play to the gate to permit it to be lifted up sufficiently to engage the recess or socket 38 over the end of the corresponding rod 35.

It will be noted that where the construction just referred to is employed the weight of the rods 35 will materially aid in shifting the valve 13 from normal to emergency position, since a comparatively slight depression of the lugs 30 will carry the pins 36 past the dead-point, whereupon the weight of the rods will shift the valve, even if the blow delivered by the yielding bar and its fingers to said lugs is not sufficient to carry the valve past a vertical position.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention. For instance, I have shown in Fig. 5 of the drawings a construction in which instead of employing a separate rod to trip the signal-gates on the receiving-hopper the supporting-rods 20 of the yielding bar are continued up into engagement with the gates, as shown at 41, in a manner which will be readily understood without detailed explanation. Again, I have shown in Fig. 6 a construction wherein the switch-valve shaft 14 is provided with a collar 41, having thereon a shoulder 42, against which bears a spring 43, which tends to so turn the shaft as to shift the valve 13 from normal to emergency position. This action is resisted by a pawl 44, which engages a shoulder 45 on the collar 31. The finger or plunger 29 is adapted when the yielding bar is depressed to trip the pawl 44 and permit the spring 43 to shift the valve. In this figure I have also shown a modified connecting mechanism between the gates 34 at the top of the receiving-hopper and the switch-valve shaft. This connection consists of a lever 46, pivoted between its ends at 47 on the frame or casing 1 and having its lower end arranged in the path of a projection 48 on the collar 31, while the upper end is bent at

right angles, as indicated at 49, to engage the gate 34. When the spring 43 shifts the valve 13, the projection 48 will so move the lower end of the lever 46 as to disengage its upper end 49 from the gate 34 and permit this latter to close. Again, I have shown in Fig. 7 a modified form of switch-valve, the shaft 14 being secured to the central part of the valve, which is indicated at 50 and which may be tilted either to one side or to the other, being held in either position by the weight of the rods 35, which are eccentrically pivoted to the shaft 14. Furthermore, although I have shown the bar as angular in form it may be circular in cross-section or in the form of a toothed roll, and although the particular mode of mounting the bar is such that it yields bodily downward it will be understood that the same result may be obtained by causing the bar to tilt in one direction or the other, or when it is in the form of a roll or cylinder by holding it frictionally and permitting it to partially rotate when engaged by a hard object. It will thus be understood that my invention is not limited to the precise details of construction hereinbefore described, and shown in the accompanying drawings.

Although I have not in the foregoing description specifically referred to the grinding or crushing functions of the yielding bar when considered in conjunction with the roll or rolls with which it coöperates, yet it is obvious that in addition to the safety involved in the yielding of the bar there is also a co-operation between the bar and the roll or rolls of such a character that a further grinding or crushing of the material occurs as the said material passes between the bar and the roll or rolls, and the material is delivered from the machine in a more thoroughly crushed or ground condition.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a grinding or crushing apparatus of the character described, provided with a normal point of discharge of the products thereof, the combination, with a crushing or grinding roll, of a yielding bar arranged in close proximity to said roll, and means controlled by the yielding of said bar for diverting the product from said normal point of discharge, substantially as described.

2. In a grinding or crushing apparatus of the character described, provided with a normal point of discharge of the products thereof, the combination, with two crushing or grinding rolls, of a yielding bar arranged in close proximity to both rolls on the discharge side thereof, and means controlled by the yielding of said bar for diverting the product from said normal point of discharge, substantially as described.

3. In a grinding or crushing apparatus of the character described, provided with a normal point of discharge for the products there-



of, the combination, with two crushing or grinding rolls revolving in the opposite direction, of a yielding bar arranged in close proximity to both of said rolls on the discharge side thereof, and means controlled by the yielding of said bar for diverting the product from said normal point of discharge, substantially as described.

4. In a grinding or crushing apparatus of the character described, provided with a normal point of discharge, the combination, with a crushing or grinding roll having circular rows of teeth, of a yielding bar arranged in close proximity to said roll and provided with notches through which the teeth pass, and means controlled by the yielding of said bar for diverting the product from said normal point of discharge, substantially as described.

5. In a grinding or crushing apparatus of the character described, provided with a normal point of discharge for the products thereof, the combination, with a pair of grinding and crushing rolls having circular rows of teeth, the paths of which overlap but do not intersect, of a yielding bar arranged in close proximity to said rolls on the discharge side thereof and provided with notches or recesses through which the teeth of the rolls pass, and means controlled by the yielding of said bar for diverting the product from said normal point of discharge, substantially as described.

6. In a grinding or crushing apparatus of the character described, the combination, with grinding or crushing rolls, and a discharge-hopper located below the same and provided with a normal outlet and an emergency-outlet, of a yielding bar located in close proximity to the rolls on the discharge side thereof, and a switch-valve controlling said outlets, and itself controlled by said yielding bar, whereby, when said bar yields, said valve is shifted to close the normal outlet and open the emergency-outlet, substantially as described.

7. In a grinding or crushing apparatus of the character described, the combination, with grinding or crushing rolls, and a yielding bar arranged in close proximity to the discharge side of said rolls, of normal and emergency outlets located on the discharge side of said rolls, a switch-valve controlling said outlets and arranged to normally open the normal outlet and close the emergency-outlet, and mechanism intermediate said bar and valve, whereby, when said bar yields, said valve will be shifted to close the normal outlet and open the emergency-outlet, substantially as described.

8. In a grinding or crushing apparatus of the character described, the combination, with crushing-rolls, and a yielding bar located in close proximity thereto on their discharge side and provided with a downwardly-extending arm, of normal and emergency outlets located on the discharge side of the rolls, a switch-valve controlling said outlets, and a rock-shaft carrying said switch-valve and

provided with a projection located in the path of the arm of the yielding bar, whereby, when said bar is depressed, the switch-valve will be shifted, substantially as described.

9. In a grinding or crushing apparatus of the character described, the combination, with grinding or crushing rolls, and a yielding bar located in close proximity thereto on their discharge side, of normal and emergency outlets on said discharge side, a switch-valve controlling said outlets, and itself controlled by the yielding bar, and a visible signal also controlled by the yielding bar, substantially as described.

10. In a grinding or crushing apparatus of the character described, the combination, with a pair of grinding or crushing rolls, a receiving-hopper above said rolls, a discharge-hopper below said rolls provided with normal and emergency outlets, a switch-valve controlling said outlets, and a yielding bar located in close proximity to said rolls on their discharge side, and controlling the switch-valve, of self-closing gates mounted on the receiving-hopper, and retaining devices for holding said gates in open position, said retaining devices being controlled by the yielding bar, substantially as described.

11. In a grinding or crushing apparatus of the character described, the combination, with grinding or crushing rolls, and a yielding bar arranged in close proximity thereto on the discharge side, of a receiving-hopper above said rolls provided with self-closing gates, a discharge-hopper below said rolls provided with normal and emergency outlets, a rock-shaft provided with a switch-valve controlling said outlets and adapted to be operated by the yielding bar, and retaining devices for normally holding said receiving-hopper gates in an open position, said retaining devices being connected with and operated by said rock-shaft to close said gates when the valve is shifted, substantially as described.

12. In an apparatus of the character described, the combination, with grinding or crushing rolls, and a bar arranged in close proximity to the discharge side thereof, of a frame or casing having slots through which the bar projects at its ends and provided with supporting-lugs above the same, rods secured to the ends of said bar and passing through said lugs, springs surrounding said rods and bearing against the lugs and against adjustable abutments on the rods, and stops adjustable on said rods to limit the upward movement of the bar by their contact with the under sides of said lugs, substantially as described.

13. In a grinding or crushing apparatus of the character described, the combination, with a frame or casing having a receiving-hopper at the top and a discharge-hopper at the bottom provided with normal and emergency outlets, of grinding or crushing rolls located in said casing between said hoppers, a yielding



bar located in close proximity to the discharge side of said rolls and having a downwardly-extending arm, a rock-shaft provided with a switch-valve controlling said outlets and having a lug arranged in the path of the downwardly-extending arm, self-closing gates mounted on the receiving-hopper, and rods normally engaging said gates to hold them

open and eccentrically connected with the rock-shaft, substantially as described. 10

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

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