Jan. 5, 1926. 1,568,571

F. I. RAYMOND

FEED REGULATOR

Filed April 24, 1925 2 Sheets-Sheet 1

Fig. 1.

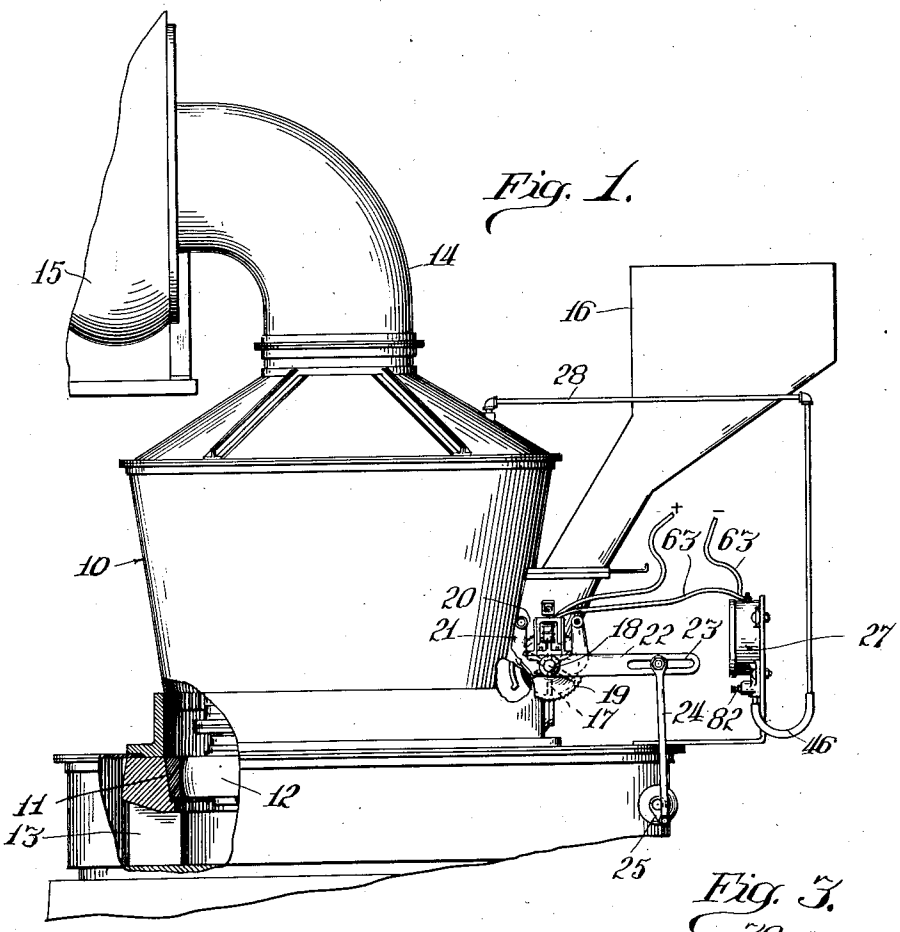


Fig. 2.

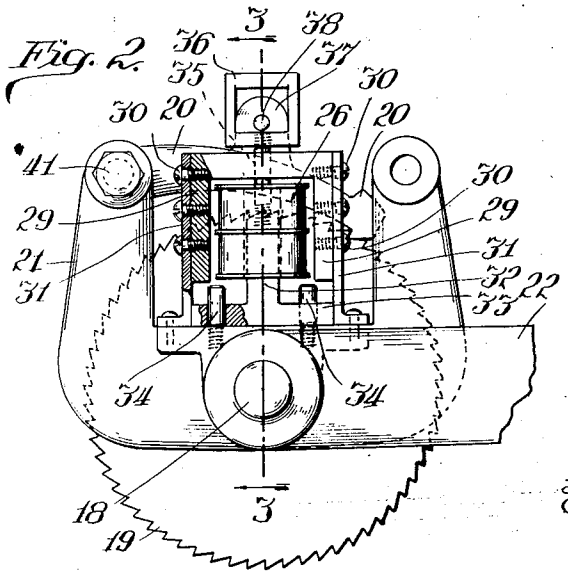
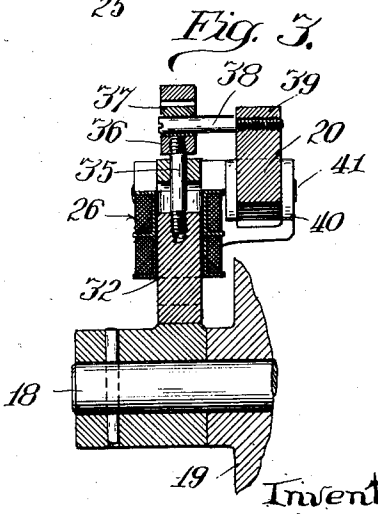


Fig. 3.



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Fig. 4.

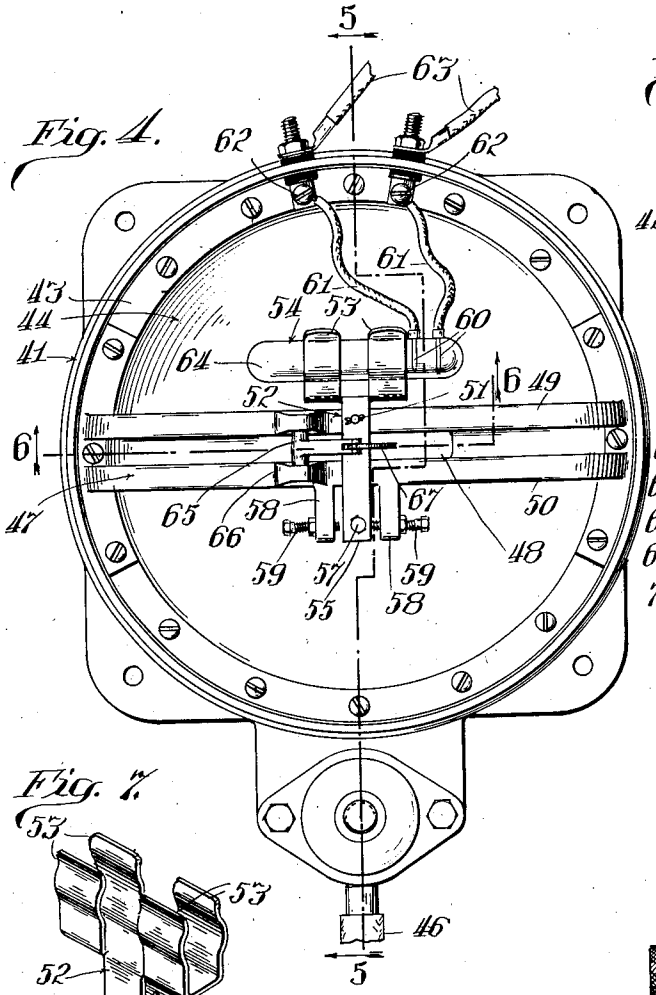


Fig. 5.

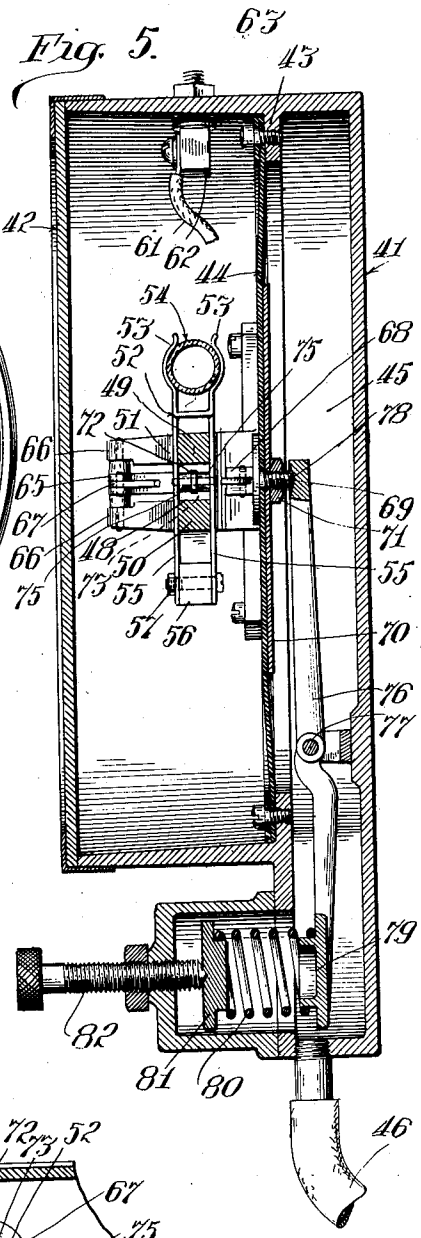
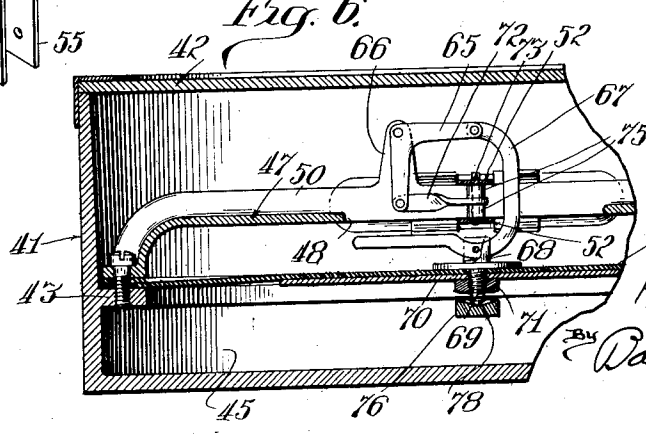


Fig. 7.

Fig. 6.



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UNITED STATES PATENT OFFICE.

FRED I. RAYMOND, OF RIVER FOREST, ILLINOIS, ASSIGNOR TO THE RAYMOND BROTHERS IMPACT PULVERIZER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

FEED REGULATOR.

Application filed April 24, 1925. Serial No. 25,561.

To all whom it may concern:

Be it known that I, FRED I. RAYMOND, a citizen of the United States, residing at River Forest, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Feed Regulators, of which the following is a specification.

My invention relates to an automatic feed regulator for pulverizing mills of the type involving the discharge of pulverized material from the mill by operation of an exhausting device, the control of the feeding mechanism being effective through changes in vacuum in the mill resulting from variation in the quantity of solids in suspension therein. That is, when the mill overloads the vacuum at or near the discharge opening will become intensified and this change of vacuum is utilized for shutting off or diminishing the feed of material to the mill until such time as a normal balance is reestablished.

My invention has for its object to provide certain novel improvements in a feed regulating mechanism of this general type, the purpose of which improvements are to simplify and cheapen the apparatus and make the same more accurate and reliable.

The invention is illustrated, in a preferred embodiment, in the accompanying drawings, wherein—

Fig. 1 is a fragmentary view, in elevation, with parts in section, of a mill of the Raymond type provided with the feed regulating mechanism of my invention.

Fig. 2 is a side elevation, with parts in section, of the electrical device for disengaging the pawl of the feed mechanism from its ratchet.

Fig. 3 is a sectional view on line 3—3 of Fig. 2.

Fig. 4 is a view, in elevation, of the pneumatically actuated circuit breaker for controlling current to the electrical device shown in Figs. 2 and 3.

Fig. 5 is a sectional view on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary sectional view on line 6—6 of Fig. 4, and

Fig. 7 is a detail view, in perspective, of a part of the circuit breaker.

Referring to the drawings, 10 designates the mill upon which the feed regulator is installed. In this type of mill pulverization of the material takes place between a bull ring 11 and a plurality of rollers 12 which move around the inner surface of the bull ring and are pressed against the ring by centrifugal force. Air enters the mill through openings 13 and is drawn from the mill, with the ground material in suspension, through discharge pipe 14 by means of an exhausting fan 15. The material to be ground is fed into the mill from hopper 16 by means of a rotary pocket feeder 17 on the shaft 18 of which is fixed a ratchet wheel 19. A pawl 20 for driving the ratchet 19 and the pocket feeder connected therewith is pivoted to an upstanding arm 21 on an oscillating lever 22 fulcrumed on the shaft 18 of the pocket feeder and formed with a slot 23 adapted to be engaged by a pitman 24 driven from crank 25 by any suitable mechanism (not shown).

The feed of material to the mill is controlled by disengaging pawl 20 from ratchet wheel 19 when the mill overloads. The pawl is lifted from the ratchet through the energization of a solenoid 26 in the circuit of which is a pneumatically actuated circuit breaker 27 which responds to changes of pressure in the upper part of the mill which reach the circuit breaker through pipe 28.

It will be understood that the invention is concerned with the construction of the feed regulator and is not to be considered as limited to the particular type of mill shown, nor is it limited to the particular mechanism employed for feeding the material into the mill.

The solenoid 26 has a yoke-like pole piece 29 to which the coil is secured, the pole piece being fastened by screws 30 to uprights 31, 31 on the oscillating lever 22. The core 32 of the solenoid has a T head

33 perforated for guide studs 34, 34 which are set into the lever 22. The core 32 has fixed to the top thereof a stud 35 which extends through the top of pole piece 29 and has secured thereto a yoke 36. Projecting into the yoke 36 is a semi-circular block 37 on the end of a stud 38 which is fixed to a boss 39 on pawl 20. The pawl is pivoted to a forked projection 40 on the upstanding arm 21 above referred to, by means of a pivot stud 41. When coil 26 is energized armature 32, 33 is pulled up against pole piece 29 and yoke 36 lifts block 37 so as to lift the pawl 20 out of engagement with ratchet 19.

In Figs. 4 to 7 inclusive, I have shown the pneumatically actuated circuit breaker which controls the current supply to solenoid core 26. 41 is a casing preferably provided with a glass cover 42 and formed with an interior flange 43 to which is secured a flexible diaphragm 44 which divides off a part of the casing to form a vacuum chamber 45 connected by flexible tube 46 with the pipe 28 which leads to the mill. Extending across the casing at the outer side of the diaphragm 44 is a bridge 47 having a central aperture 48 and formed with a pair of spaced outstanding webs 49, 50. Straddling the bridge 47 and pivoted at 51 to the web 49 is a carrier 52, preferably made of sheet metal, and comprising clips 53, 53 to engage and hold a tube 54 and a pair of depending legs 55, 55 which extend on opposite sides of the bridge and have their lower ends clamped against a spacing block 56 by means of a bolt 57. The lower end of the carrier projects between lugs 58, 58 on the bridge, these lugs being provided with adjustable stop studs 59. Inserted into tube 54 are a pair of spaced contacts 60 connected by wires 61 to binding posts 62 on flange 43. These binding posts extend through the casing, being properly insulated therefrom, and have connected thereto the lead wires 63 of the circuit through solenoid core 26. Tube 54 contains a body of mercury 64 which in one tilted position of the carrier provides an electrical connection between contacts 60, and in the other tilted position of the carrier (Fig. 4) is at the other end of the tube so that the solenoid circuit is broken at contacts 60.

The carrier is rocked or tilted by the following mechanism: 65 is a bell crank pivoted in a bifurcated bracket 66 on the bridge 47 and 67 is a link pivoted to one end of bell crank 65 and to a button 68 on diaphragm 44. The button has a threaded end 69 extending through the diaphragm and through a rigidifying disc 70 on the inner side of the diaphragm, and the button is secured to the diaphragm and disc by a nut 71. The other end of bell crank 65 is connected by a link 72 with a stud 73 extending through the perforations 74 and riveted or otherwise secured to the rocking member, spacing sleeves 75 being interposed between link 72 and the legs 55 of the rocking member. By this arrangement the movements of the diaphragm 44 are transmitted to the carrier so that tube 54 is rocked to make and break the circuit.

In order to adjust the circuit breaker to operate at different vacua and to prevent it from being affected by slight pressure changes, a lever 76 is fulcrumed at 77 in chamber 45 and bears against the pointed end 78 of the bolt 69. The other end of lever 76 is provided with a spring seat 79 against which bears a coiled spring 80, the other end of which spring is engaged by a follower 81 bearing against an adjusting screw 82.

Operation.—When the mill overloads the vacuum in the upper part of the mill is intensified, whereupon diaphragm 44 is drawn into chamber 45 rocking lever 76 to compress spring 80. This movement of the diaphragm rocks bell crank 65 so as to move link 72 from right to left (Fig. 6) whereby the carrier 52 is rocked to tilt the tube 54 from the position shown in Fig. 4 to a position in which the body of mercury 64 provides an electrical connection between the contact points 60. The circuit is now closed through solenoid 26 which attracts its core 32, 33, lifting pawl 20 out of engagement with ratchet 19 and thereby stopping the feed of material to the mill. When the mill has cleared normal pressure is reestablished in chamber 45 with the result that the circuit breaker is operated to break the solenoid circuit allowing the pawl 20 to again engage the ratchet 19.

I claim:

1. In combination with a mill, means for feeding material into the mill, and means for exhausting air and pulverized material from the mill; a feed regulating mechanism comprising a pneumatic device, an electrically actuated device for controlling the operation of the feeding means, and a circuit making and breaking device for said electrically actuated device comprising a vessel having a pair of spaced contacts and containing a conducting fluid, and means operated by said pneumatic device for imparting rocking movements to said vessel.

2. In combination with a mill, means for feeding material into the mill comprising an operating ratchet and pawl, and means for exhausting air and pulverized material from the mill; a feed regulating mechanism comprising a pneumatic device, an electrically actuated device for disengaging said pawl from the ratchet, a circuit mak-

ing and breaking device for said electrically actuated device comprising a vessel having a pair of spaced contacts and containing a conducting fluid, and means operated by said pneumatic device for imparting rocking movements to said vessel.

3. In combination with a mill, means for feeding material into the mill, and means for exhausting air and pulverized material from the mill; a casing and a diaphragm extending across the same providing a vacuum chamber connected with the mill; a circuit breaker mounted for oscillation and comprising a vessel having a pair of spaced contacts and containing a conducting fluid, connections between said vessel and diaphragm whereby the vessel is oscillated through movements of the diaphragm; and an electrically operated mechanism for controlling the feeding means, the circuit through which is controlled by said circuit breaker.

4. In combination with a mill, means for feeding material into the mill, and means for exhausting air and pulverized material from the mill; a casing and a diaphragm extending across the same providing a vaccum chamber connected with the mill; a lever in said chamber, one end of which bears against said diaphragm, a spring bearing against the other end of the lever, and means for adjusting the stress of the spring on the lever; a circuit breaker mounted for oscillation and comprising a vessel having a pair of spaced contacts and containing a conducting fluid, connections between said vessel and diaphragm whereby the vessel is oscillated through movements of the diaphragm; and an electrically operated mechanism for controlling the feeding means, the circuit through which is controlled by said circuit breaker.

5. In combination with a mill, means for feeding material into the mill, and means for exhausting air and pulverized material from the mill; a casing and a diaphragm extending across the same providing a vacuum chamber connected with the mill; a circuit breaker mounted for oscillation and comprising a vessel having a pair of spaced electrodes extending therein and containing a conducting fluid; connections between the vessel and diaphragm whereby the vessel is oscillated through movements of the diaphragm, a ratchet and pawl mechanism for operating the feeding means, and a magnet, the circuit through which is controlled by said circuit breaker.

6. In combination with a mill, means for feeding material into the mill, means for exhausting air and pulverized material from the mill, and electircally operated mechanism for controlling the feeding means, and a circuit breaker for said electrically operated mechanism comprising a casing, a diaphragm providing a vacuum chamber connected with the mill, a bridge extending across the chamber, a tube having a pair of spaced contacts extending thereinto, and containing a conducting fluid, a holder for said tube mounted for oscillation on the bridge, and connections between the holder and diaphragm whereby movements of the diaphragm are imparted to the holder.

7. In combination with a mill, means for feeding material into the mill, means for exhausting air and pulverized material from the mill and electrically operated mechanism for controlling the feeding means, a circuit breaker for said electrically operated mechanism comprising a casing, a diaphragm providing a vacuum chamber connected with the mill, a bridge extending across the chamber, a tube having a pair of spaced contacts extending thereinto and containing a conducting fluid, a holder for said tube mounted for oscillation on the bridge, a lever pivoted to the diaphragm, a bell crank on the bridge connected to the lever, and a link on the bell crank connected with said holder.

8. In combination with a mill, means for feeding material into the mill, means for exhausting air and pulverized material from the mill and electrically operated mechanism for controlling the feeding means, a circuit breaker for said electrically operated mechanism comprising a casing, a diaphragm providing a vacuum chamber connected with the mill, a bridge extending across the chamber, a tube having a pair of spaced contacts extending thereinto and containing a conducting fluid, a holder for said tube mounted for oscillation on the bridge, a lever pivoted to the diaphragm, a bell crank on the bridge connected to the lever, a link on the bell crank connected with said holder, a lever in said chamber, one end of which bears against the diaphragm, a spring bearing against the other end of the diaphragm, and means for adjusting the stress of said spring.

9. In combination, a mill, means for exhausting air from the mill, a rotary feeding device for introducing material into the mill, a ratchet thereon, a lever oscillating coaxially with the feeder, a pawl on the lever to engage the ratchet, a solenoid mounted on the lever adjacent the pawl, the solenoid having a core, a pawl lifting device on said core adapted to lift the pawl from the ratchet when the solenoid is energized, and means responsive to pressure changes in the mill for controlling the current through said coil.

10. In combination, a mill, means for exhausting air from the mill, a rotary feed-

ing device for introducing material into the mill, a ratchet thereon, a lever oscillating coaxially with the feeder, a pawl on the lever to engage the ratchet, a solenoid on the lever having a core, a pawl lifting device on said core adapted to lift the pawl from the ratchet when the solenoid is energized, a casing provided with a diaphragm which with the casing forms a vacuum chamber connected with the mill, a tube having a pair of contacts extending thereinto and containing a conducting fluid, an oscillating holder for said tube, and connections between said holder and diaphragm whereby movements of the diaphragm are imparted to the holder.

FRED I. RAYMOND.