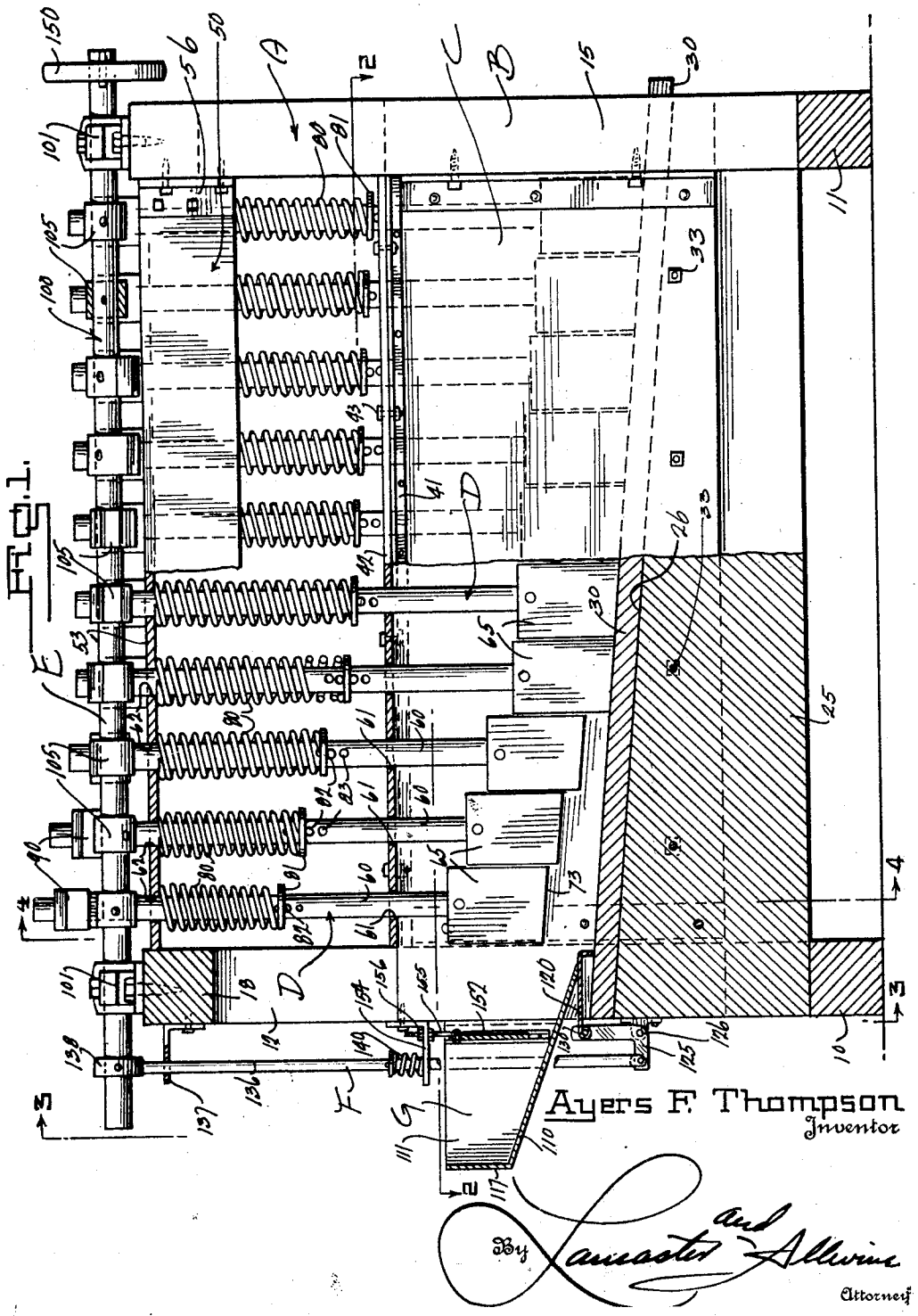
June 4, 1929. A. F. THOMPSON 1,715,724

PULVERIZER

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PULVERIZER

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Fig. 2.

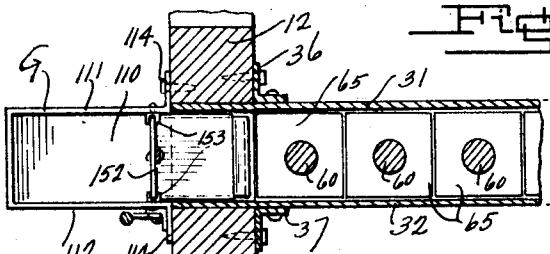


Fig. 4.

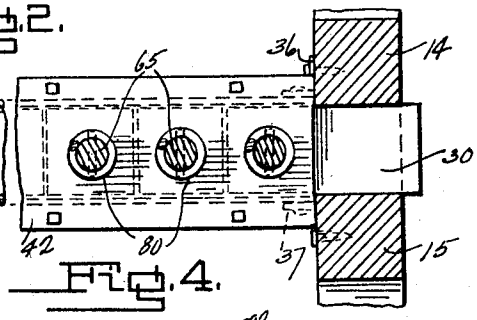
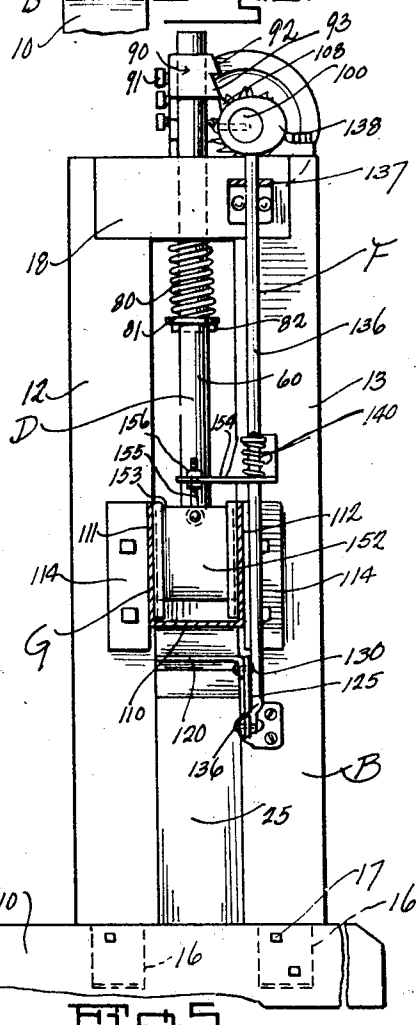


Fig. 3.



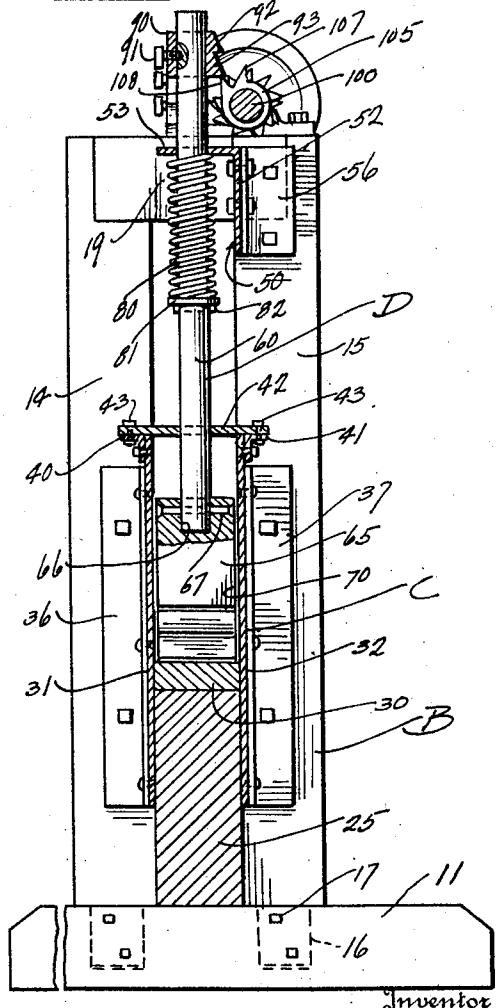
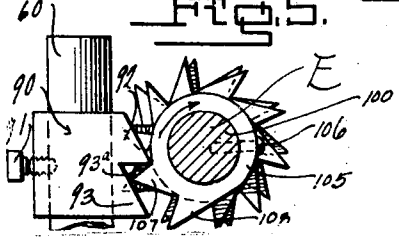


Fig. 5.



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UNITED STATES PATENT OFFICE.

AYERS F. THOMPSON, OF SUNLAND, CALIFORNIA.

PULVERIZER.

Application filed June 13, 1927. Serial No. 198,530.

This invention relates to improvements in machines for pulverizing ore and the like.

The primary object of this invention is the provision of an improved pulverizing machine, particularly well adapted for use in connection with the pulverizing of ores in order to obtain valuable minerals therefrom, the improved machine being one which is relatively small and compact, and can be with facility transported to relatively inaccessible places where heavy ore crushing machines cannot be taken; the improved machine being operable upon a principle which does not need the use of water as an aid to the flow and pulverizing of the ore.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a side elevation, partly in section, showing the improved pulverizing machine with several of the hammers thereof in an operative relation.

Figure 2 is a fragmentary view, partly in section, showing details of the improved machine, the view being taken substantially on the line 2—2 of Figure 1.

Figures 3 and 4 are sectional views taken substantially on their respective lines of Figure 1 of the drawings.

Figure 5 is a fragmentary sectional view showing a lifting cam and ratchet block on which the same operates.

In the drawings, wherein for the purpose of illustration is shown but a preferred embodiment of the invention, the letter A may generally designate the improved pulverizing machine, which may comprise a frame B, having a pulverizing trough or receptacle C thereon; the improved frame B reciprocably supporting hammers or pulverizers D operated by means E. Means F is provided to push ore from a trough G to the chamber of the pulverizing receptacle C.

The frame B preferably comprises a pair of end base cross pieces 10 and 11, the base piece 10 having spaced uprights or posts 12 and 13 supported thereon, and similarly the base piece 11 having spaced uprights or posts 14 and 15 supported thereon. The posts or uprights 12, 13, 14 and 15 are supported on their respective bases by having reduced tenon ends 16 supported in a morticed relation in sockets provided in the base pieces 10 and 11, and held therein by dowel pins or members 17, as illustrated in Figures 3 and 4 of the drawings.

At the upper ends thereof the uprights 12 and 13 have a cross piece or beam 18 morticed and secured therein and similarly the upper ends of the uprights 14 and 15 support a cross piece 19.

Preferably resting on the base pieces 10 and 11, between the respective posts supported thereon is a longitudinally extending supporting beam or platform 25, the upper surface 26 of which slopes in a plane outwardly from the posts of the base piece 10 towards the posts on the base piece 11.

Referring to the pulverizing receptacle or box C, the same is preferably of metal formation, and supported by the uprights 12 to 14 inclusive and by the platform 25. On the top surface 26 of the platform 25 is a relatively thick steel floor plate 30, which may be secured thereon in any approved relation, which in width is equal to the width of the beam 25.

Side plates 31 and 32, preferably of metal, are secured to the beam 25, at their lower margins by means of transversely extending bolts 33 which extend through the beam 25. The plates 31 and 32 extend in length the entire length of the beam 25, and at their ends they are secured against the facing surfaces of the posts 12 to 15 inclusive; the plates 31 being secured to the facing surfaces of the posts 12 and 14, by means of connecting angles 36, illustrated in Figure 2 of the drawings, and the plates 32 being similarly secured to the facing surfaces of the uprights or posts 13 and 15, by means of angles 37, securely riveted or bolted in place.

The plates 31 and 32 at the upper edges thereof are provided with angle members 40 and 41 respectively, riveted in place, and at the outer sides of said plates, providing horizontal flanges upon which a detachable cover plate 42 may rest; for securement to the angles 40 and 41 by means of detachable bolts 43, as best illustrated in Figure 4 of the drawings. This cover plate 42 extends the length of the receptacle between the posts 12 to 15.

Referring more particularly to the hammers D and means for supporting the same, it is to be noted that a supporting angle or

member 50 is secured, at the ends thereof, between the uprights 13 and 15, which aids in the securing of the upper ends of the uprights at the ends of the machine A. This angle member 50 provides a vertical leg 52 and a horizontal leg 53 lying immediately above and in spaced relation with the cover plate 42 of the pulverizing chamber or receptacle C. At its ends the leg 52 is secured to the uprights 13 and 15 by means of angle pieces 56 riveted or bolted in place to said vertical leg and the facing surfaces of the upper ends of the uprights 13 and 15, as illustrated in Figures 1 and 4 of the drawings.

Each of the hammer constructions D includes the rod or body portion 60, supported in aligning openings 61 and 62 provided in the cover plate 42 and angle leg 53 respectively. The lower end of the hammer body or rod is provided with a substantially polygonal shaped hammer head 65, provided with a socket 66, as illustrated in Figure 4, in which the lower end of the respective rod 60 fits and is held therein by means of a cross pin 67. The hammer head 65 in width is about equivalent to the chamber 70 wherein the pulverization takes place, and in cross section the head 65 is preferably square. The lower surface 73 thereof is beveled in a parallel relation with the top sloping surface of the floor plate 30, as illustrated in Figure 1 of the drawings.

On each of the hammer rods 60 is positioned a spiral compression spring 80 between the cover plate 42 and angle leg 53; the springs 80 engaging the under surface of the angle leg 53 and at their lower ends resting on suitable washers 81 held in place by cotter pins 82 which may be positioned in any of a number of apertures 83 provided through each of the rods 60, in order to retain the springs 80 under a desired compression; the compression acting to normally force the hammer head 65 against the pulverizing floor 30, as illustrated in Figure 1 of the drawings.

At their upper ends each of the hammer rods 60 supports, above the angle 50, a ratchet block or head 90, in the form of a sleeve through which the rod 60 extends; the ratchet 90 being adjusted on the rod 60 by means of a set screw 91; and an important structural feature of the ratchet 90 being the provision of an upper tooth 92, at a side thereof, providing a preferably horizontal surface 93ª facing downwardly and in a plane spaced above the lower edge of the ratchet 90; the ratchet 90 below the upper tooth 92 being sloped at an acuate angled relation to provide a second or lower tooth, the lower edge of which is flush with the lower edge of the ratchet 90, as is best illustrated in Figure 5 of the drawings.

Referring to the means E for operating the hammers D, the same comprises a horizontal operating shaft 100, rotatably bearing in suitable journal boxes or bearings 101 supported on the top cross pieces 18 and 19; the rod 100 extending along the side of the plane in which the hammers D lie. On the shaft 100 for each hammer rod 60 is positioned a cam 105, suitably keyed as at 106 in any suitable relation for rotation with the shaft 100, each of said cams 105 including a pair of closely spaced teeth 107 and 108, preferably pointed and at a tangential relation on the cam.

During rotation of the shaft 100 the foremost tooth 107 of the cam engages the under surface 93ª of the upper tooth 92 of the respective hammer ratchet 90, initially elevating the hammer so that the head 65 is raised above the floor plate 30. As the shaft 100 continues to rotate the second cam tooth 108 comes into engagement with the under surface of the ratchet tooth 93, and of course the cam tooth 107 then rides off the upper tooth 92, and upon continued rotation of the cam the hammer head 65 is further elevated; the highest elevated relation of the hammer in so far as it is permitted to be elevated by the ratchet and its respective cam being illustrated in Figure 4 of the drawings.

The trough G is preferably of metal, including a sloping floor 110, having spaced side walls 111 and 112 rigid therewith, said side walls being flanged at 114 and secured to the posts 12 and 13, as illustrated in Figure 2 of the drawings, with the floor 110 extending into the space between the posts 12 and 13 above the floor plate 30, so that ore deposited in the trough G will be carried downwardly by gravity over the floor 110 into the pulverizing receptacle floor plate 30, as can readily be understood from Figure 1. The ore box G furthermore includes an outer retaining wall 117, the top of the box being open for receiving ore in an unobstructed relation. The forward edge of the floor 110 of the box G is spaced above the top surface of the plate 30, and in this space is reciprocably disposed a pusher 120, forming part of means F for pushing the ore after it has fallen along the ore box floor 110, into the ore receptacle C beneath the first hammer head 65. This pusher 120 is preferably of metal formation, and the means for operating the same comprises a bell crank lever 125 pivoted as at 126 on the end surface of the beam 25, one end of the bell crank lever 125 being pivotally secured at 130 to the rear end of the pusher 120, the other end of the bell crank lever being secured to the lower end of a reciprocating rod 136; the said reciprocating rod at its upper end being guided for reciprocation in a bracket 137. On the shaft 100 above described is positioned an eccentric or cam 138, against which the upper end of the rod 130 is forced by a compression spring 140, in order that the rod 136 may be reciprocated as the shaft 100 rotates, as is readily

apparent from Figures 1 and 3 of the drawings. As the rod 136 reciprocates it will operate the bell crank lever 125 on its pivot 126, and reciprocate the pusher 120 back and forth over the plate 30 to push the ore from the ore box G beneath the first hammer head 65, as is readily apparent from Figure 1.

The operating cams 105 are so positioned with respect to each other that the hammers D will be lifted and lowered successively from one end of the machine A towards the other end, it being preferred that about ten of the hammers D should be used in the machine A, and that not more than three of the same should be elevated above the pulverizing floor 30 at any one time, and these at different degrees of elevation.

The shaft 100 at one end is provided with a pulley wheel 150 or like expedient, and any approved means may be provided to drive the shaft 100, as desired and available.

It is readily apparent from the foregoing description of this invention that an ore pulverizing machine has been provided, which is very compact. The ore will have a continuous flow along the machine, without interruption, aided by the successive feeder impact of the hammers; by the gravity slope of the first plate 30; by the current of air caused by the hammers falling successively, and also because of the pusher effect of the means F; the pulverized ore being discharged at the extreme lower end of the floor, as is readily apparent.

An adjustable ore flow controlling gate 152 is positioned in the ore trough G, for vertical sliding, the same being guided at its side margins by suitable channels 153, and the same being held at a desired elevation on a suitable angle plate or bracket 154, which comprises also a support for the spring 140 above mentioned; the gate 152 having an adjustable screw threaded shank 155 extending through this plate or bracket 154 and being held on the plate 154 in a desired relation by means of adjustable lock nuts 156, as is apparent from Figures 1 and 3 of the drawings.

Various changes in the shape, size, and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a pulverizing machine the combination of a supporting frame, a floor plate on the frame having a top surface sloping from one end of the machine towards the other end thereof, spaced side walls carried by the frame at opposite sides of the floor plate and extending above the floor plate, a detachable cover on the tops of said side walls providing a compartment therebelow between the side walls, means for feeding ore into the compartment at one end thereof, hammers, and means to operate the hammers in said compartment for pulverizing the ore therein.

2. In a pulverizing machine the combination of a supporting frame, a floor plate on the frame having a top surface sloping from one end of the machine towards the other end thereof, spaced side walls carried by the frame at opposite sides of the floor plate and extending above the floor plate, a detachable cover on the tops of said side walls providing a compartment therebelow between the side walls, means for feeding ore into the compartment at one end thereof, hammers, an elongated supporting member in spaced relation above said cover carried by said frame, said cover and said elongated member having aligning openings therein, a plurality of rods reciprocably supported in said aligning openings and at their lower ends extending into the compartment, hammer heads on said rods in said compartment, and means operating on said rods to reciprocate the same in an ore pulverizing hammer relation in said compartment.

3. In a pulverizing machine the combination of a supporting frame, a floor plate on the frame having a top surface sloping from one end of the machine towards the other end thereof, spaced side walls carried by the frame at opposite sides of the floor plate and extending above the floor plate, a detachable cover on the tops of said side walls providing a compartment therebelow between the side walls, means for feeding ore into the compartment at one end thereof, hammers, an elongated supporting member in spaced relation above said cover carried by said frame, said cover and said elongated member having aligning openings therein, a plurality of rods reciprocably supported in said aligning openings and at their lower ends extending into the compartment, hammer heads on said rods in said compartment, means operating on said rods to reciprocate the same in an ore pulverizing hammer relation in said compartment, said means comprising ratchets on the upper ends of said rods, a rotatable shaft, cams operating on said shaft operating on said ratchets to lift said rods, and springs acting on the rods to normally lower the same into an ore pulverizing relation upon release of the ratchets by said cams.

4. In a pulverizing machine a frame, a pulverizing receptacle, a reciprocating hammer operating in said receptacle, a member on the hammer providing a pair of teeth, a rotatable shaft, and a cam acting on the shaft having a pair of teeth one of which is adapted to engage one of the teeth of said ratchet and upon release thereof the other tooth being adapted to engage the other tooth of said ratchet to elevate the hammer.

5. In an ore pulverizing machine a frame including spaced end uprights, an elongated supporting beam connected with said spaced

end uprights, spaced side walls connected with said supporting beam and extending thereabove, a floor plate between said plates on said supporting beam sloping from one end of the beam towards the other end thereof, a cover plate on said side walls having apertures therein, means for feeding ore onto the floor plate between said side walls, an angle member connected at its ends to said uprights and spaced above said cover plate, said angle member having apertures therein aligning with the apertures of the cover plate, reciprocating rods slidably mounted in said aligning apertures and having hammer heads thereon between said side walls, said reciprocating rods above the angle having ratchet teeth thereon, springs on the rods between the supporting angle and cover plate urging the hammer heads downwardly against the floor plate, an elongated shaft, and toothed cams on the shaft for the ratchet teeth of the rods for engagement thereby to elevate said hammer heads.

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