

J. T. FOWLER.
PULVERIZER.
APPLICATION FILED APR. 1, 1914.

1,339,950.

Patented May 11, 1920.
3 SHEETS—SHEET 1.

Fig. 1.

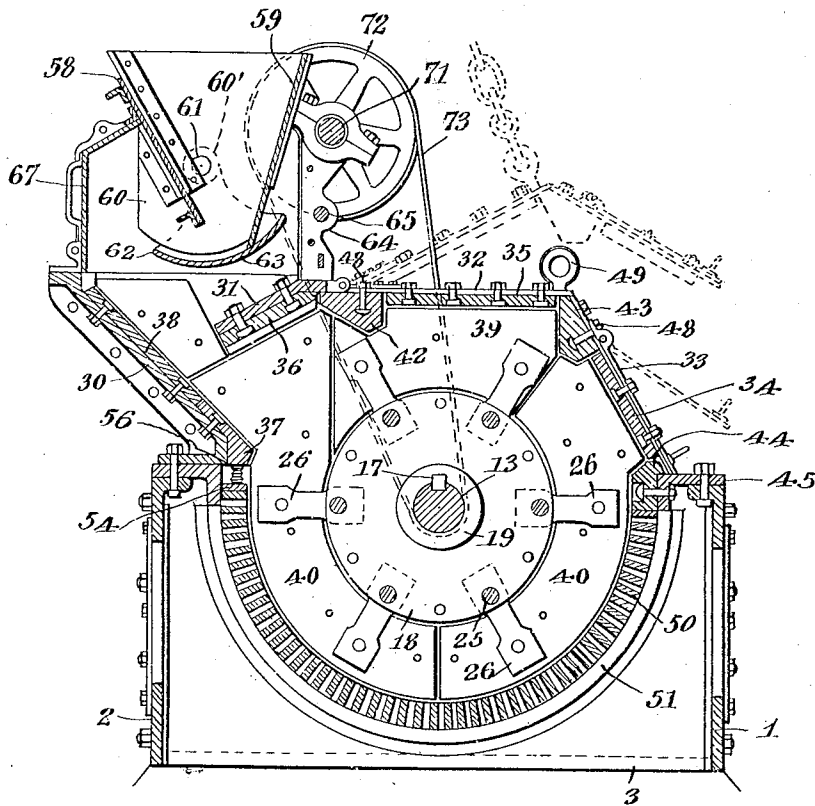


Fig. 5.

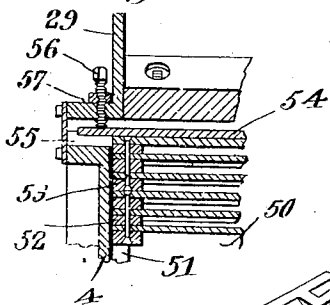


Fig. 7.

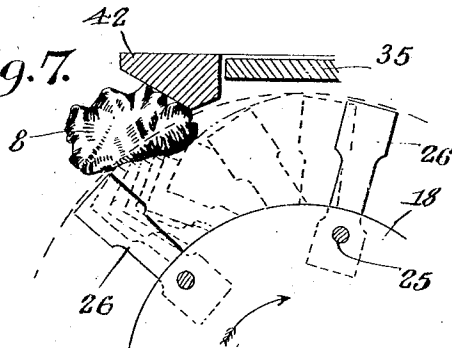
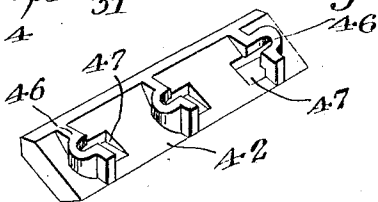


Fig. 6.



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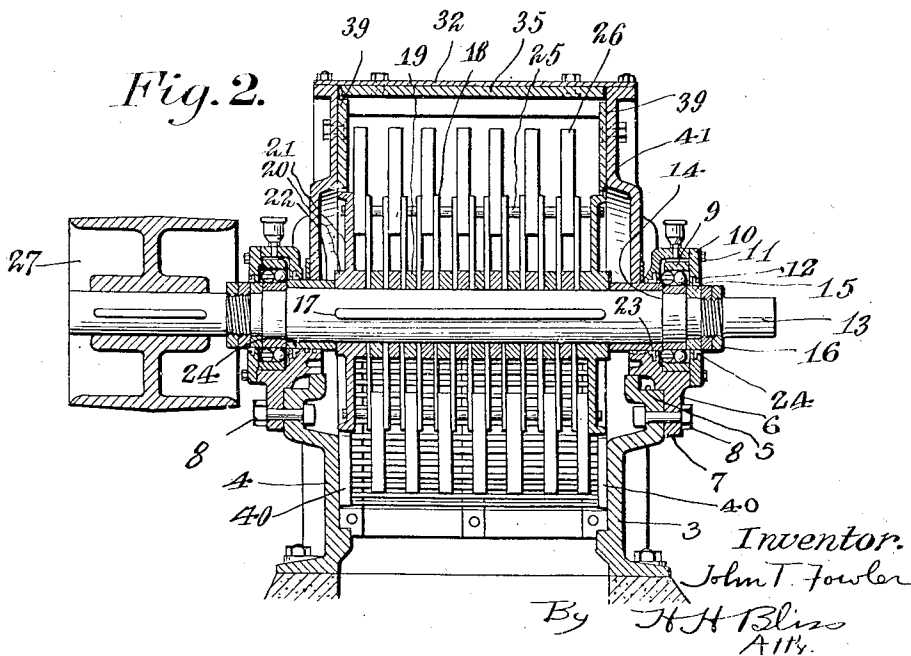
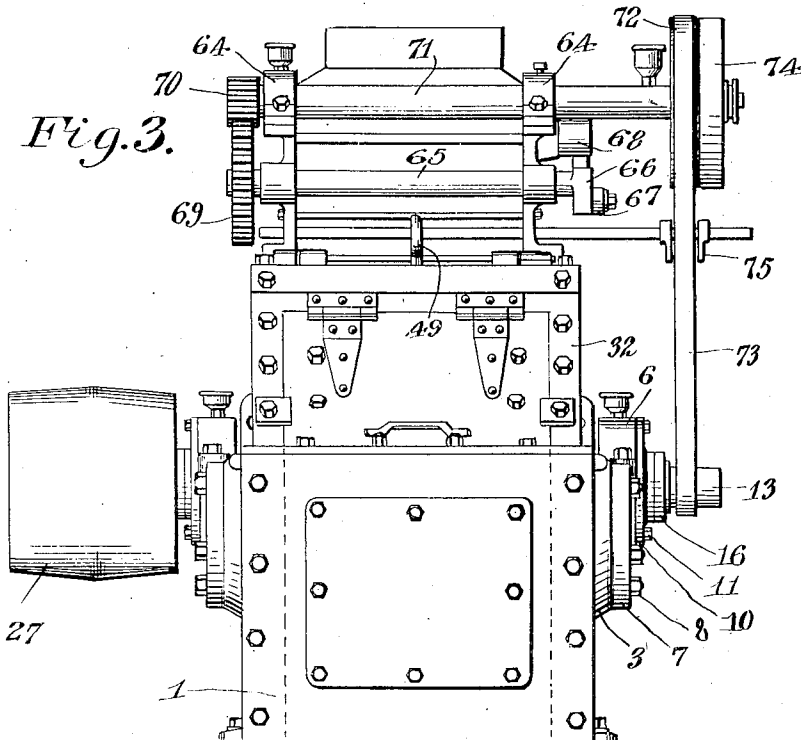
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3 SHEETS—SHEET 2.

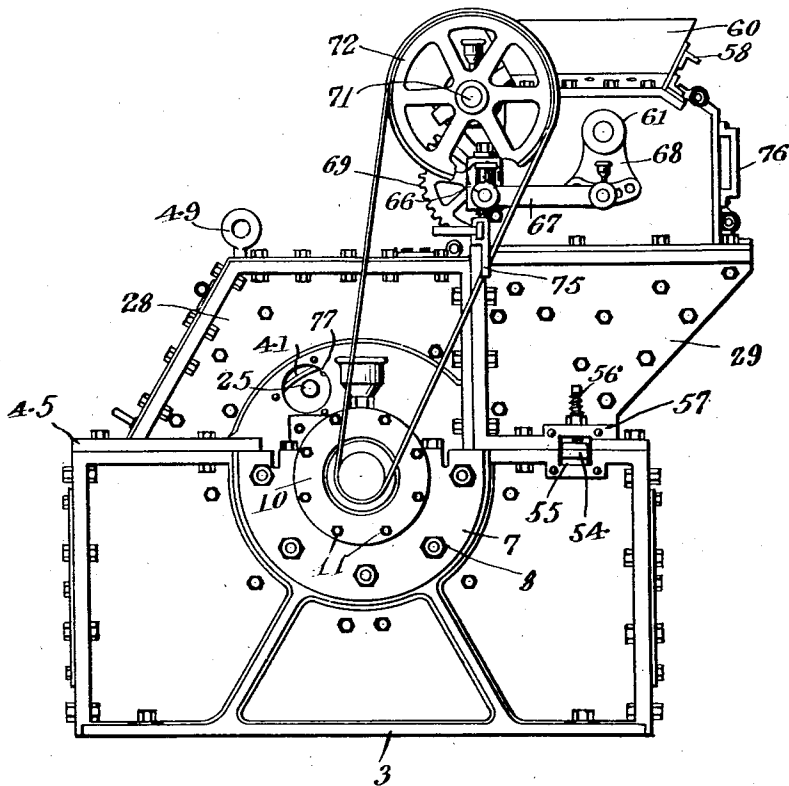


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3 SHEETS—SHEET 3.

Fig. 4.



Inventor.

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UNITED STATES PATENT OFFICE.

JOHN T. FOWLER, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

PULVERIZER.

1,339,950.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN T. FOWLER, 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 Pulverizers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to swing hammer pulverizers of the class of mechanisms in which each is provided with a rotor, comprising a shaft, an axially arranged series of hammer-carriers and a series of sets of peripherally arranged hammers pivoted to the said carriers, a casing surrounding the said rotor, and a grating supported in the casing below the rotor.

The object of the invention is to provide a construction of this class which will be more compact and, other things being equal, will occupy less space than pulverizers as heretofore made, will have the rotor shaft mounted exclusively upon the lower section of the casing, and have the rotor and all the parts attached thereto, together with its bearings, removable from the casing, and will have the upper part of the casing normally free from the rotor and its bearings.

Figure 1 is a transverse vertical section of the preferred embodiment of my invention.

Fig. 2 is a longitudinal vertical section taken on the center line of the main shaft of the machine.

Fig. 3 is a front elevation of the machine.

Fig. 4 is an elevation looking toward the right hand end of the machine.

Fig. 5 is a fragmentary sectional view illustrating the manner of securing the screen bars in place.

Fig. 6 is a detail of the breaker plate.

Fig. 7 is a diagrammatic view illustrating the action of the hammers and breaking plates upon fragments of material during the process of pulverization.

Like numerals refer to similar parts in the several figures.

As shown in the drawings, the machine has a casing or housing, together with the necessary movable parts, the casing itself serving also as a framework or support for the latter. As illustrated, this casing has a lower element and an upper element comprising a rear section and a forward section.

The lower casing element has the side plates 1 and 2 and the end plates 3 and 4 all rigidly bolted together.

The rear section and the front section of the upper casing element each has side plates together with inclined end plates and parts at the top, to be more fully specified.

In the upper edges of each of the end plates of the lower casing element there is a semi-circular bearing seat 5 in which rests a bearing shell 6 having a flange 7 secured to the frame plate by the bolts 8.

Each end wall or plate is swelled radially outward at the central part of its upper edge to provide a strong support for a shaft bearing and is so shaped as to provide a counter-sink chamber to receive the inner heads of the bolts 8. Formed in the bearing casing or shell 6 concentrically with the bearing seat 5, is an annular recess in which is fitted the outer ring 9 of a ball bearing which is held against longitudinal displacement by the retaining ring 10 secured to the face of the shell in any preferred manner as by cap screws 11. The inner ring 12 of the ball bearing is fitted to the shaft 13 and is clamped between the shoulder 14 of the shaft and the clamping ring 15 by the lock nuts 16 screw threaded to the shaft.

The bearings and the shells 6 are, it will be seen, held in fixed position, axially, on the shaft independently of the casing.

Fastened to the shaft 13 by the key 17 is a drum composed of a plurality of disks 18 held in spaced relation by spacing collars 19 and kept from longitudinal movement along the shaft by the hubs 20 of the end disks 21 which in turn abut against the sleeves 22 and these against the ball bearing rings 12. Felt washers 23 and 24, inserted in suitable grooves of the bearing shell and retaining ring, prevent the access of dust to the interior of the ball bearing.

Mounted in apertures of the disks 18 and 21 are pivot rods 25 upon which are pivoted the pulverizing hammers 26.

The pulley 27 serves to connect the shaft with any convenient source of power for the rotation of the drum and its attached hammers.

The front section of the upper element of the casing has end walls 28 and 29. To these are secured the parts of a front inclined wall 33 and the top part 32. The inclined plate and the top plate, together with the end

plates, are secured to the stationary plate 31 by hinges on horizontal axes which permit the cover element to be swung upward to afford opportunity for inspection and repair of the hammers and their attachments, and, if necessary, to permit the removal of the rotor.

In the upper inclined part 33 there is a door which is held by a hinge and which permits more readily the inspection of the interior.

The flanged piece 45, bolted to the lower part of the inclined wall, is in turn bolted to the wall 1 of the lower element of the housing when the cover element is to be fastened in place.

In order to provide chambers within the outermost walls of the casing, one at each end of the rotor, I cast each end wall of the lower casing element, and in each end wall of the upper casing element an outwardly swelled part. As above described, the bearings 6 are secured to the lower parts that are so outwardly swelled at 5.

The inner faces of all the various plates and castings which are exposed to the action of the material in process of pulverization are protected by renewable linings of hard iron, as at 34, 35, 36, 37, 38, 39 and 40. Flanges 41, formed on the end disks 21, serve to close the space between the rotor drum and the linings 39 and 40 to prevent the escape of material from the ends of the pulverizer chamber.

Secured to the cover plate 32 are chilled iron breaker plates 42 and 43. The working faces of these are in planes approximately tangential to the peripheries of the disks 18 and approximately perpendicular to the paths of the hammers as they approach. The inner edges of the plates are adjacent the paths of the hammers. A similar plate 44 is secured to the cross member 45 which is bolted to the top edge of the main frame.

As the breaker plates are directly in the paths of, and receive the impact of the flying fragments of the material being pulverized, it is apparent that the heads of the supporting bolts would be quickly destroyed if they extended into the interior of the casing. To obviate such destruction there are formed on the backs of the breaker plates 42 and 43 ribs 46 in which are formed recesses 47 adapted to receive the heads of the attachment bolts 48 to support the breaker plates and allow of convenient renewal.

An eye bolt 49, attached to the cover plate 32, affords a convenient attachment for a crane hook or other lifting means for raising the cover.

When the front section of the upper casing element is turned upward, as shown in Fig. 1, the rotor can, as an entirety, be readily removed bodily from the casing for

repair, either of the rotor or of any of the interior parts of the casing.

The rotor shaft 13 rests entirely upon the lower casing element. The bearings at the ends of the rotor shaft are units and composed of parts which can remain together under all circumstances. The bolts that secure the bearings to the casing wall can be quickly removed, and, as above stated, the rotor removed as an entirety.

In order that material shall be retained within the path of the hammers until pulverized to sufficient fineness, the pulverizing chamber is provided with a floor of transverse bars spaced at such intervals that the fine material will fall through without allowing the escape of the larger fragments. These screen bars 50 are supported at their ends on semi-circular flanges 51 of the plates 3 and 4 and are held in spaced relation by spacing blocks 52, held in place by suitable rivets 53. For convenience in assembling the screen bars and spacer blocks are commonly made up in sections of three or more bars.

At the front of the machine the bars 50 bear against the breaker plate 44, and at the rear against the clamping bar 54, the ends of which extend into the apertures 55 of the castings 3 and 4 and are pressed by the set screws 56 threaded through the flanges 57 of the castings 29 to clamp the screen bars securely in place.

Material to be pulverized may be fed into the machine by any preferred type of feeder. In the drawings I have shown for the purpose of illustration, a feeder comprising a hopper having a front plate 58, a back plate 59 and end plates 60. In bearings 60' of the end plates 60 are journaled trunnions 61 upon which is mounted for oscillation a valve 62 the bottom plate 63 of which is arcuate and concentric with the trunnions. The back plate 59 extends to within a working clearance of the upper surface of the valve plate 63 to prevent the passage of material therebetween. The front plate 58 may be adjusted toward or from the valve plate 63 to vary the width of the opening between them to regulate the depth of material flowing over the valve.

Mounted in suitable bearings 64 of the end plate 60 is a crank shaft 65 having a crank 66 connected by a rod 67 to the arm 68 attached to the valve 62 to oscillate it. The crank shaft 65 is rotated through the gears 69 and 70 by the intermediate shaft 71 which is connected through the pulley 72 and the belt 73 with the shaft 13. A loose pulley 74 and a belt shifter 75 provides for the cutting off of the power from the feeder when it is not desirable that it should operate. A convenient cover door 76 prevents the escape of dust from the pulverizer chamber and affords facility for the inspection of the feeder valve during its operation.

Convenient apertures are provided in the housing casting 28 at 77 to admit of the insertion or withdrawal of the pivot rods 25. These apertures are normally covered by cover plates which have been omitted from the drawings.

The operation of the machine is as follows: As material introduced into the pulverizing chamber falls from the lower edge of the hopper lining 37 it comes in contact with the rapidly rising hammers and is driven by them against the breaker plate 42 from which the fragments rebound, gravity assisting to quickly bring them again within the path of rotation of the hammers. Owing to the rapidity of the revolution of the hammers they present nearly a continuous surface for the material to fall upon, exerting a brushing effect which I have diagrammatically illustrated in Fig. 7, where the fragment 78 is shown as having been driven by the hammer 26 against the breaker plate 42. The successive positions of the hammer are shown by the dotted lines. As fragments pass the breaker plate 42 they will be driven against the next breaker plate 43 being further reduced in size until, on reaching the screen bars they drop through and pass out of the machine. By this method of operation there is great increase in the capacity of the machine, due to the material passing around more than half the circumference of the pulverizing chamber before reaching the screen and to the fact that gravity tends to increase the opportunity for action on the fragments of material by the hammers. There is a great improvement in the uniformity of the product due to the increased time during which the particles are subjected to the action of the hammers before they reach the screen, and there is an increase in the life of the breaker plates due to their being supplemented by the action of gravity in the holding of the material to the hammers. It will be observed that the feed opening is so positioned that no material can be thrown out through it by the hammers.

As the ball bearings are mounted entirely outside of the pulverizing chamber the tendency for dust and fine grit from the material being treated to enter the bearings is reduced to a minimum.

What I claim is:

1. The combination of the lower casing section, having end walls formed with axially outwardly swelled bearing seats, the

bearing shells rigidly fastened exclusively to the said swelled parts of the lower casing section, the pulverizer rotor, comprising a series of sets of pivoted hammers, the flanged disks 21 at the ends of the series of hammers, and the shaft, the ball bearings in said bearing shells, the upper removable casing section, supported in operative position independently of the bearings, and adapted to be separated from the lower casing section while said lower section and said shaft hold all of their parts in normal operative relationship.

2. The combination of the lower casing section, having end walls each formed at its upper edge with a bearing seat, the bearing shells each having an approximately semi-circular flange secured exclusively to an end wall of the lower casing section, the bearings in the said shells, a pulverizer rotor comprising a series of sets of swinging hammers and a shaft which is mounted in the said bearing shells, means for securing the bearing shells and bearings axially on the shaft independently of the casing, and an upper casing section adapted to be held rigidly in working position independently of the bearings and to be separated from the lower section of the casing and from the rotor while all of their parts remain in working positions.

3. The combination of the lower casing section, having end walls each formed with an outwardly swelled substantially semi-cylindrical bearing seat, the bearing shells each having an approximately semi-circular flange secured to the said outwardly swelled part of an end wall, a pulverizer rotor comprising a series of sets of swinging hammers and a shaft which is mounted in the said bearing shells, bearing rings and interposed balls in each of said shells, means for holding the bearings and bearing shells axially in position on the shaft independently of the casing, and an upper casing section adapted to be held rigidly in working position independently of the bearings and separable from the lower section and from the rotor while all of their parts remain in normal working positions.

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

JOHN T. FOWLER.

Witnesses:

P. J. HENRY,

DUDLEY T. FISHER.