Nov. 9, 1926. 1,606,692

E. N. BROOKS

PULVERIZER

Filed May 13, 1925 2 Sheets-Sheet 1

Fig. 2.

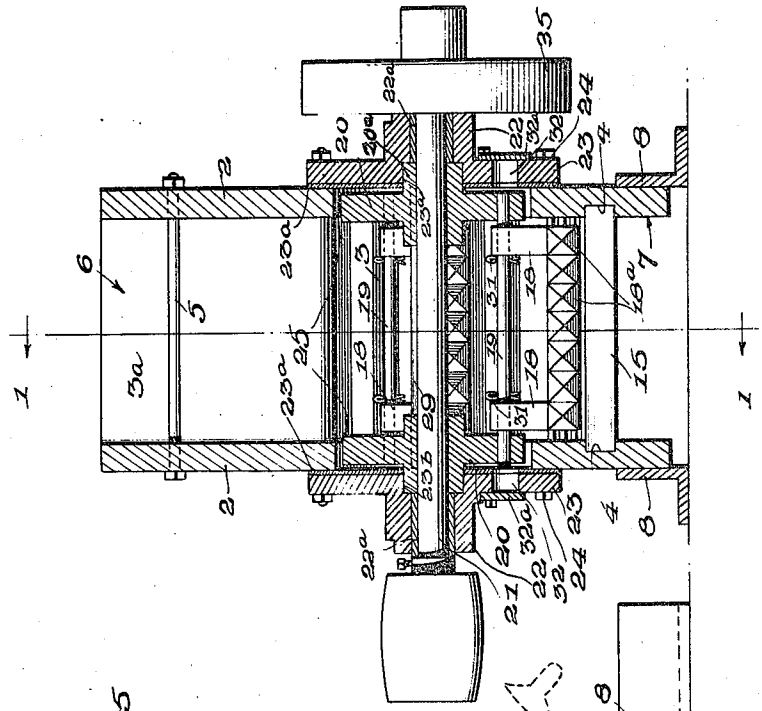
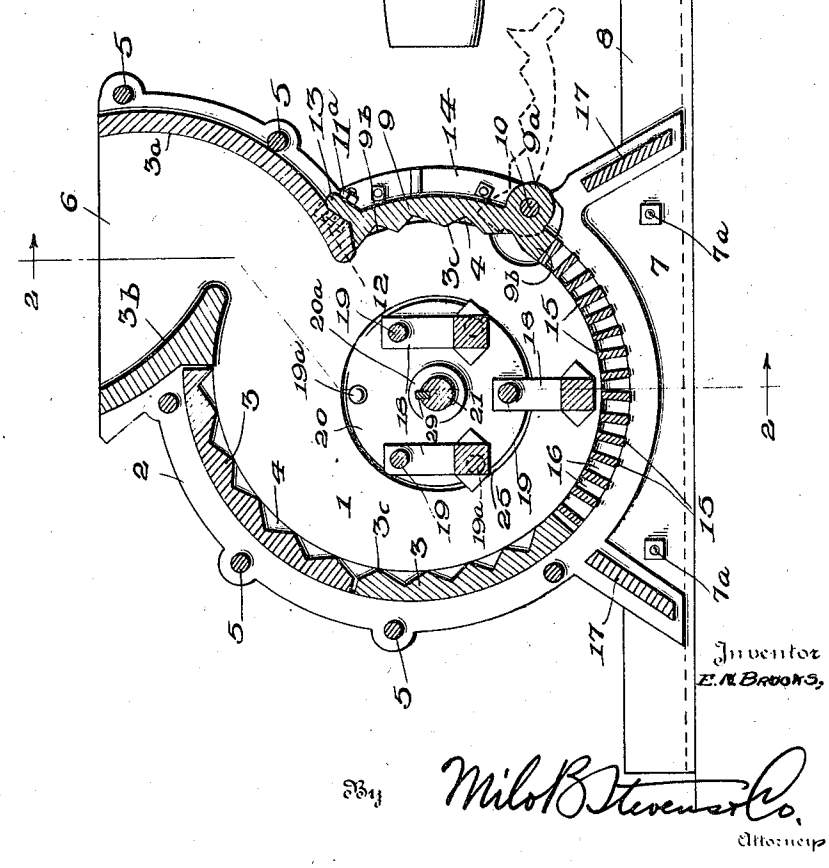


Fig. 1.



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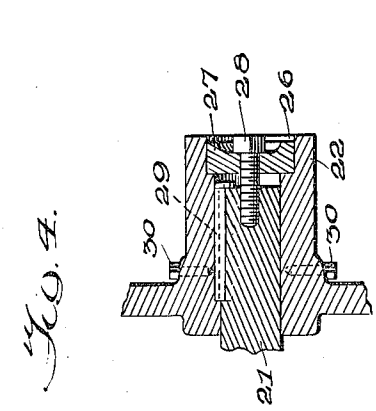


Fig. 4.

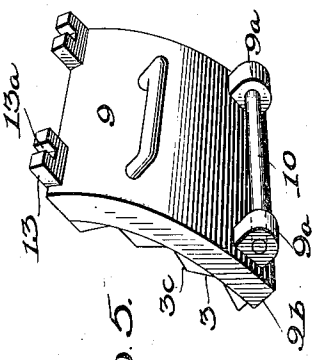


Fig. 5.

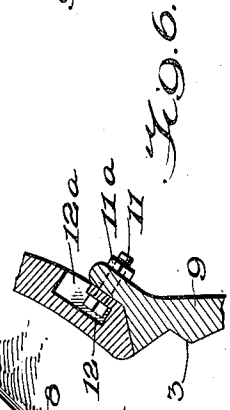


Fig. 6.

Fig. 7.

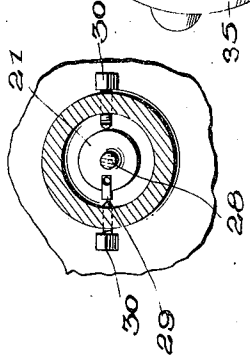


Fig. 3.

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UNITED STATES PATENT OFFICE.

ERNEST N. BROOKS, OF KNOXVILLE, TENNESSEE, ASSIGNOR TO DAY PULVERIZER COMPANY, OF KNOXVILLE, TENNESSEE.

PULVERIZER.

Application filed May 13, 1925. Serial No. 30,119.

My invention relates to machines for disintegrating or pulverizing limestone and other materials, and more particularly to a machine of this kind in which the material is subjected to the action of a series of rapidly revolving beaters in a cylinderical casing.

Disintegrators or pulverizers of this kind are provided with a screen or grate through which the finely reduced material is permitted to escape. The machine itself is constructed of very heavy material and, broadly speaking, the only parts which are subjected to any appreciable amount of wear are the beaters and the screen or grate members. Accordingly it is one of the important objects of this invention to provide a means whereby access may be readily had to such parts without dismantling the machine and also without weakening the construction thereof. The invention further contemplates a novel and improved structure whereby the grate or screen and the beaters will be effectively held in place and may be expeditiously removed as occassion may require either for the purpose of repair or replacement.

I also aim to provide an improved construction whereby the main bearings supporting the revolving beater mechanism will be rendered dust-proof, means being availed of for taking up any looseness or end play of the shaft supporting such mechanism.

The aforegoing and other objects are attained by means of a novel combination and arrangement of parts and in order that the same may be better understood reference should be had to the accompanying drawing forming a part of the specification and in which like reference characters have been used to designate similar parts throughout. It is to be understood that the drawing illustrates what I now regard as a preferred construction but it will be apparent that various changes and modifications may be made therein without departure from the subject matter claimed hereinafter.

In the drawings:

Figure 1 is a sectional view through the machine taken on line 1—1 of Figure 2;

Figure 2 is a similar view taken on line 2—2 of Figure 1;

Figure 3 is a sectional detail illustrating a portion of the fly-wheel hub and particularly an improved form of removable key;

Figure 4 is a longitudinal sectional view through the hub of the fly-wheel and illustrating a means whereby end-play of the beater supporting shaft may be taken up;

Figure 5 is a detail in perspective of the swinging wall section or door member permitting access to the interior of the machine;

Figure 6 is a sectional detail drawn to slightly enlarged scale and illustrating a means for holding the door in closed position, and

Figure 7 is a perspective view of the machine with the door swung open there being depicted a supplemental swingingly mounted hopper member in addition to the fixed hopper.

Referring specifically to the drawing, numeral 1 denotes generally the substantially cylinderical casing or compartment in which the disintegrating or pulverizing takes place, the same being made up of end plates or castings 2 and cross plates 3, the latter being received in grooves 4 adjacent the outer edges of the end plates and the whole assembly rigidly bound together through the medium of tie-rods 5 which pass through the apertured marginal ears of the end plates. The shape of the end plates or castings 2 is such as to define, with cross members 3^a and 3^b, a hopper 6 which is disposed above and opens into the compartment 1. The lower portions of the end castings 2 flare outwardly in the direction of their width as indicated at 7 so as to form a base for the machine which may be attached by means of bolts 7^a to angle irons 8, these latter facilitating the mounting of the machine upon skids or a wheeled frame as occasion may require.

The cross plates 3 are of extra heavy iron and have their inner surfaces corrugated or roughened as denoted at 3^c and in order that the same may be rendered more durable they are preferably chilled on the inside to a depth of about an inch, they being thus enabled to more effectually withstand the pounding from the rock or other material. The outer portions of the plates 3 being relatively soft as compared with the inside portions prevents breaking. After the cross plates are in place I find it desirable to pour Babbitt metal into the grooves 4 at the edges of the plates, this serving as a cushion and

taking up all looseness in addition to equalizing all strains upon the plates.

At the back of the machine I provide a swinging section or door 9 which is pivoted by means of ears 9[a] and a rod 10 to the end plates or castings 2. This door has its inner surface roughened or corrugated in the same manner as the cross plates 3 and will, of course, be of substantially the same thickness and of proportionate weight. It is, of course, of primary importance that the door 9 in its closed position be practically an integral part of the casing wall. To this end I employ a pair of bolts 11 extending from the outer face of cross piece 3[a] and which are removably retained in place by engagement of their heads in the undercut grooves 12 which open at their upper ends into surface recesses 12[a] of such size as to admit said bolt heads. The projecting shanks of the bolts are receivable in the open ended slots 13[a] of integral lugs 13 projecting from the upper edge of the door 9 and the application and tightening of nuts 11[a] upon the bolt shanks prevents outward movement of the door while the machine is in use. It will be, of course, appreciated that by this construction the heads of the bolts within the grooves 12 will not be subjected to wear from the material as the latter passes from the hopper 6 into the chamber or casing 1. As an additional means for reinforcing and retaining the door 9 in closed position, I avail myself of arcuate strips 14 which are bolted through the marginal projecting portions of the end plates or castings 2, the inner edges of such strips abutting against the door. This expedient is especially desirable when very hard and heavy material is being pulverized.

The grate which I employ is, generally speaking, of more or less conventional form and includes separate transversely disposed bars 15 which are received edgewise between the walls of the groove 4 and which are spaced from each other by wedges 16 also carried in the grooves. The width of the spaces between the bars 15 may be varied, according to the fineness or coarseness of disintegration necessary in a given case, by using wedges 16 of different widths. It will frequently be necessary to change the spacing between the grate bars 15 and also from time to time replace the worn bars with new ones. All of this may be readily accomplished by opening the door 9 to the position shown in dotted lines in Figure 1. The back walls of the grooves 4 are, of course, cut away at the side of the door, as will be apparent from an inspection of the drawings (particularly Figs. 1 and 7), and it will, therefore, be understood that when the door is open the grate bars may be conveniently taken out. Attention is here invited to the fact that the door 9 has what might be termed a heel portion 9[b] which is adapted when the door is closed to bear against the outer surface of the endmost grate bar 15 and compress the entire assembly of grate bars, the door and its heel portion operating in the same manner as a lever.

In Figure 1 there is illustrated at either end of the base a dust-board 17 extending transversely between the flared end casting portions 7. Either or both of these may be removed to enable the ground material to be shoveled out from beneath the grate bars or removed by means of any form of conveyor, the latter being well known in the art.

Coming now to the beater mechanism and referring particularly to Figure 2 it will be observed that the U-shaped beaters 18 are hung from rods 19 which are received within marginal transverse apertures in two disks 20 located at opposite sides of the machine and keyed to a shaft 21 which is journaled in bearings 22 carried by disk-like plates 23, the same being bolted as at 24 to the end plates or castings 2. These end plates or castings are provided with circular openings 25 through which the disks 20 are adapted to be inserted. The purpose of this construction is to enable the beater mechanism to be removed from the machine without separating the end castings 2 from the cross plates 3.

The plates 23 have medial concentric openings 23[b] in their inner surfaces of a diameter considerably greater than the diameter of the shaft bearing, these recesses being designed to receive the hubs 20[a] of the beater supporting disks 20, and the ends of the hubs as shown in Figure 2 will abut against the inner end of the bearing 22 above the Babbitt metal wear portion 22[a]. From the foregoing it will be evident that dust from within the cylindrical casing or chamber 1 will be prevented from reaching the bearings 22 since to do so it would necessarily have to pass outwardly between the peripheries of the disks 20 and the walls of the openings 25 in the end castings 2; from thence downwardly and between the hubs 20[a] and the walls of the opening in the plate 23 to the bearings 22, and finally across the ends of the hubs to the Babbitt metal portion of the bearing supporting the shaft 21. Since the ends of the hubs 20[a] snugly engage the bearings no dust will be permitted to pass. Should, per chance, the shaft 21 develop any longitudinal or end play, one or both of the disk hubs 20[a] would have a tendency to recede from intimate contact with their respective bearings 22 exposing the same to dust. In order to correct such a condition I have provided in connection with the bearing carrying plates 23 and fly-wheel 35 upon the shaft 21 a suit-

able take-up means which will now be described.

The hub or pulley of the fly-wheel 35 has in its end a recess 26 designed to receive a dust-plate 27, the latter having a central aperture through which loosely passes a bolt 28 the same being threaded into a tapped opening in the end of the shaft 21. It will be evident that by tightening the bolt 28 the dust plate 27 will press against the fly-wheel hub and urge the wheel more firmly on the shaft thus correcting any end play which may have developed. If the fly-wheel is already firmly on the shaft, tightening of the bolt 28 will pull the shaft bodily in the direction of the fly-wheel to bring the hub 20^a of the proximate disk 20 into close engagement with its bearing 22. The action just described may result in withdrawing the hub 20^a of the other or remote disk 20 away from its bearing 22. The space so developed may be taken up or corrected and dust prevented from reaching the bearing 22 remote from the fly-wheel. As will be noted in Figure 2, I have provided between the bearing carrying plates 23 and the side castings 2 the washers 23^a which may be of beaver board, rubber or other material. Thus, assuming that some little space has been developed between the last mentioned hub 22^a and its bearing such space may be taken up very readily by tightening the bolts 24 and bringing the disks 23 into more intimate contact with the outer surfaces, of the end plate castings 2.

The fly-wheel 35 is keyed to the shaft 21 as shown in Figures 3 and 4 by means of a special key 29 having a laterally bent end portion through which extends a tapped aperature 29^a. This laterally bent end of the key 29 lies substantially flush with the end of shaft 21. When it is desired to move the key it is only necessary to start a screw into the aperature 29^a. Continual turning of the screw causes its end to bear against the end of the shaft and result in the withdrawal of the key in a very efficient manner. It might be noted at this point that the dust plate 27, in addition to its function which has been heretofore noted, serves to prevent the key 29 from working out and catching in clothing, etc. The fly-wheel 35 will be properly centered by means of set screws 30, and one of these set screws as indicated in Figures 3 and 4 bears against the key 29 to prevent it from becoming loose.

Each of the beaters 18 is provided with two working faces each face having formed thereon a series of pyramidal protuberances 18^a which give them the breaking and crushing capacity of a large number of integrally connected hammers. The life of each beater is materially extended due to the fact that it has two working faces. When one becomes worn the beater may be reversed as will be presently described and the other surface utilized.

Referring to Figure 2 it will be noted that the beaters are retained in place upon their rods 19 by means of cotter-pins 31 passing therethrough. The bearing carrying disks 23 are provided with diametrically opposite openings 32 which will be normally closed by suitable escutcheons 32^a. When it is desired to remove any of the beaters 18 the door 9 is first opened. The operator then reaches in with a pair of pliers and pulls out the cotter pins 31. This having been done the escutcheons 32^a may be raised and the rods 19 successively alined with the openings 32, and hammered out by means of a cold chisel or other suitable implement. The beater or beaters may then be taken out through the door, reversed and again put in position so that the unused working face will be in a position to act upon the material. The disks 20, as will be noted in Fig.1, have an extra set of apertures, denoted at 19^a, for receiving the ends of the beater supporting rods 19. These openings are relatively closer the peripheries of the disks than the other set of openings and are to be used after the beaters have been pretty well worn down. The very maximum service is thus gotten from each beater by making use of both working surfaces and of the extra set of disk aperatures 19^a.

An additional purpose in providing the openings in the end plates or castings 2 other than to permit the introduction of the beater supporting disks 20 is to increase the capacity of the machine by permitting said disks 20 to be housed within said openings to leave a greater space for material, it being further observed that this construction permits beaters of substantially larger size to be used than would otherwise be possible.

I claim as my invention:

1. In a disintegrator comprising a substantially cylindrical body portion having end castings and intermediate cross members and a screened outlet opening; the combination of a rotatable shaft, disks carried by said shaft within said disintegrator and adjacent the end castings thereof, the latter having openings through which said shaft passes and of substantially larger diameter than said shaft, plates carried by the outer faces of said end castings and having bearings for supporting said shaft, hubs extending laterally from said disks and through the openings of said end castings to engagement with the ends of said bearings, a wheel keyed to one end of the shaft and means for maintaining said hubs in contact with the ends of said bearings whereby to prevent the entry of dirt therein, said means including a wheel carried element and a shaft carried element, and means whereby

said bearings may be adjusted in the direction of the axis of said shaft.

2. A disintegrator comprising a substantially cylindrical disintegrating chamber, rotatable beater members disposed within said chamber, the latter having a screened outlet opening, means whereby said beaters may be removed without dismantling the machine, said chamber having a second opening in one wall thereof, a closure for said opening, means removably carried externally of said chamber for maintaining said closure in effective position and means associated with said closure and carried by the sides of said chamber for reinforcing the closure when in closed position.

3. In a disintegrator comprising a substantially cylindrical body portion having end castings and intermediate cross members and a screened outlet openings; the combination of a rotatable shaft, disks carried by said shaft within said disintegrator and adjacent the end castings thereof, the latter having openings through which said shaft passes and of substantially larger diameter than said shaft, plates carried by the outer faces of said end castings and having bearings for supporting said shaft, hubs extending laterally from said disks and through the openings of said end castings to engagement with the ends of said bearings, a wheel keyed to one end of the shaft, and means for maintaining said hubs in contact with the ends of said bearings whereby to prevent the entry of dirt therein, said means including a wheel carried element and a shaft carried element.

4. In a disintegrator comprising a substantially cylindrical body portion having a disintegrating chamber therein, said body portion including end castings and cross members disposed there-between and having a screened outlet opening from said chamber, a rotatable beater mechanism including a shaft extending axially through the medial portion of said chamber, plates carried by the outer faces of said end castings and having medial openings therein, shaft supporting bearings carried by said plates for receiving the ends of said shaft which project through said aforementioned openings and means carried by said shaft adjacent said openings and in intimate contact with the ends of said bearings to prevent the entry of dirt therein.

5. A disintegrator comprising in combination, a body portion including end castings and cross members disposed therebetween to define a substantially cylindrical disintegrating chamber, said end castings having relatively large circular openings, plates affixed to the outer faces of said end castings for closing said openings, said plates having openings of smaller diameter than said end casting openings and being concentric therewith, a shaft, bearings for receiving the ends of said shaft and carried by said plates, disks carried by said shaft rotatable within and housed by the walls of said end casting openings, hubs projecting from said disks and rotatable within the openings of said plates, the ends of said hubs abutting the ends of said bearings for preventing the entry of dirt therein and a beater mechanism carried by said disks.

6. A disintegrator comprising a body portion having side and end walls and a material outlet opening, a removable screen positionable in said opening, two opposite walls of said body portion having means whereby to support said screen, said body portion having an opening through which access may be had thereto and to the interior of said body portion, a closure for said opening, and an eccentric cam member at the lower portion of said closure controlled by the movement of said closure and effective when the same is in closed position for locking said screen against movement.

7. A disintegrator comprising a body portion including end castings and intermediate cross members and having a material outlet opening, a removable screen positionable across said opening, said end castings having grooves for receiving and retaining the ends of said screen and said body portion having an opening into which said grooves lead and through which said screen may be inserted into the grooves and movable means for retaining said screen within said grooves.

8. A disintegrator comprising a body portion including end castings and intermediate cross members and having a material outlet opening, a removable screen positionable across said opening, said end castings having grooves for receiving and retaining the ends of said screen and said body portion having an opening in communication with said grooves through which said screen may be inserted thereinto, a closure for said opening, and an eccentric cam member at the lower portion of said closure and carried thereby for clamping said screen in place when the closure is in effective position.

9. A disintegrator comprising a body portion having a disintegrating chamber, a rotatable shaft in said chamber, bearings for said shaft, block rigidly carried by said shaft adjacent each end thereof, beater members carried by said blocks, a fly-wheel carried by said shaft beyond one of said bearings, the hub of said fly-wheel having a counter-sunk portion and the end of said shaft having a tapped recess, a centrally apertured dust plate positionable in said counter-sunk portion, a screw extending through the aperature of said dust plate and engageable in said tapped recess whereby upon rotation of said screw the proxi-

mate block will be drawn into intimate contact with the inner end of the proximate bearing, and means associated with the other bearing remote from said fly-wheel for moving the same into intimate contact with the other block.

10. In a disintegrating machine having a disintegrating chamber, a shaft extending through said chamber, bearings for said shaft disposed beyond the outer faces or opposite walls of said chamber, the combination of a fly-wheel carried at one end of said shaft, and a key insertable between said fly-wheel and said shaft for rigidly connecting the two, said key having a laterally bent end portion adapted to overlie the end of the shaft, said laterally bent end portion having a tapped aperture therein whereby upon starting a screw in said aperture the end thereof will engage the end of said shaft, thus effecting a withdrawal of said key.

11. A disintegrator comprising a body portion including end castings and intermediate cross members and having a material outlet opening, a removable screen positionable across said opening, said end castings having grooves for receiving and retaining the ends of said screen and said body portion having an opening into which said grooves lead and through which said screen may be inserted into the grooves, a closure for said opening, and said closure having a portion engaging the end part of said screen whereby to retain the same against movement in the direction of the said opening.

In testimony whereof I affix my signature.

ERNEST N. BROOKS.