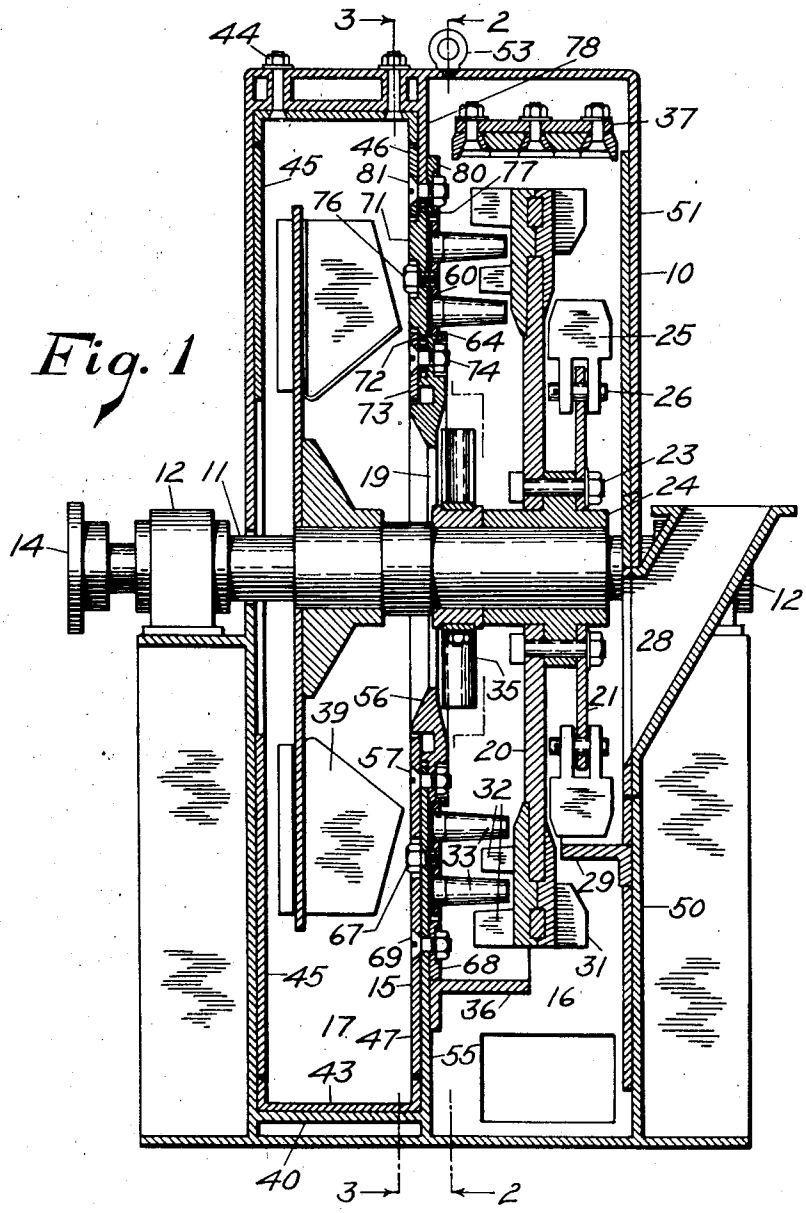
Jan. 12, 1932. L V ANDREWS 1,840,380

PULVERIZING APPARATUS

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Fig. 1



INVENTOR
L. V. ANDREWS
BY
Albert G. Blodgett
ATTORNEY

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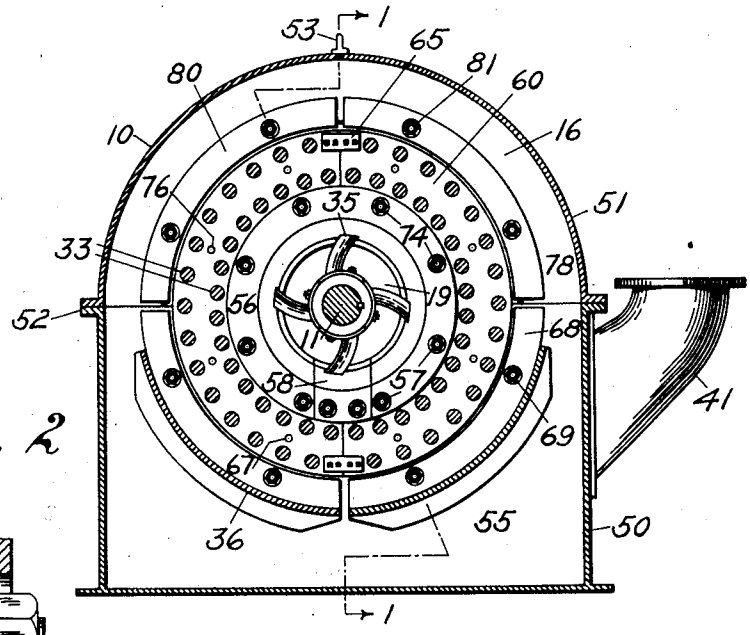


Fig. 2

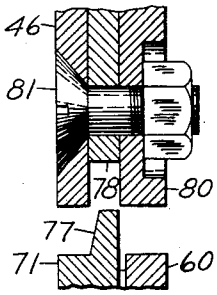


Fig. 5

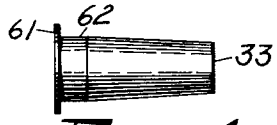


Fig. 4

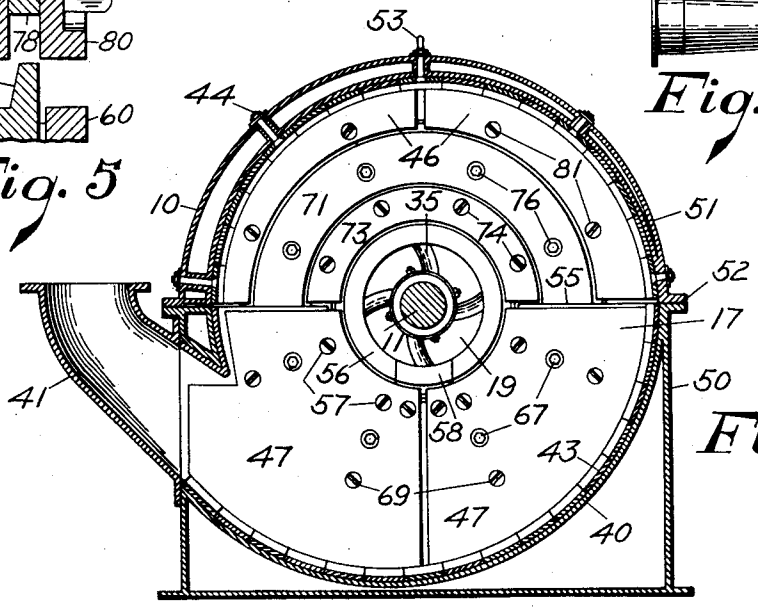


Fig. 3

INVENTOR
L. V. ANDREWS
BY
Albert G. Blodgett
ATTORNEY

Patented Jan. 12, 1932 1,840,380

UNITED STATES PATENT OFFICE

L V ANDREWS, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO RILEY STOKER CORPORATION, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

PULVERIZING APPARATUS

Application filed October 31, 1930. Serial No. 492,541.

The invention relates to pulverizing apparatus, and more particularly to pulverizing apparatus of the rotary beater type. In some respects the invention may be considered as an improvement over the construction disclosed in the patent to Riley et al. No. 1,759,134.

This prior patent shows an apparatus comprising a pulverizing chamber having a central outlet leading to a fan chamber. A fan in the fan chamber and a rotor in the pulverizing chamber are driven by a common shaft. The central outlet is surrounded by concentric rows of stationary pulverizing pegs which are mounted on the wall of the pulverizing chamber, and which pulverize material by cooperating with revoluble pegs mounted on the rotor.

The main object of the present invention is to provide a pulverizing apparatus which will be more compact than the construction disclosed in the said prior patent, and which will occupy less floor space, have a shorter and stiffer shaft, be lighter and less expensive to manufacture, and be readily accessible for renewal of wearable parts.

With this and other objects in view as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

In accordance with my invention I provide a hollow casing through which there extends a substantially horizontal shaft carrying a fan and a rotor having pulverizing elements mounted thereon. The casing is split into upper and lower portions, preferably along the horizontal axial plane, and the upper portion is removable to permit access to the interior of the apparatus without disturbing the shaft or the parts supported thereby. The interior of the casing is divided into a pulverizing chamber and a fan chamber by a vertical partition having a central opening therein which forms an outlet for the pulverizing chamber. This partition carries a number of stationary pulverizing elements or pegs which cooperate with the rotor in pulverizing the material finely. The lower portion of the partition and so much of the upper portion thereof as carries the stationary pegs are supported by the lower half of the casing. The upper half of the casing is arranged to form a tight joint with the partition, and yet it may be readily removed independently of the partition whenever it is necessary to replace the stationary pegs or other wearable parts in the interior of the machine.

Referring to the drawings illustrating one embodiment of the invention, and in which like reference numerals indicate like parts:

Fig. 1 is a cross section of a pulverizing apparatus, the section being taken approximately on the line 1—1 of Fig. 2;

Fig. 2 is a cross section on the line 2—2 of Fig. 1;

Fig. 3 is a cross section on the line 3—3 of Fig. 1;

Fig. 4 is a detail of a stationary peg; and

Fig. 5 is an enlarged detail of the joint in the partition, in a slightly separated position.

The embodiment illustrated in the drawings comprises a casing 10 through which there extends a horizontal shaft 11. This shaft is mounted in bearings 12 and is provided with a half coupling 14 or other suitable means for connecting the shaft to a source of power. The interior of the casing is divided by a vertical partition 15 into a pulverizing chamber 16 and a fan chamber 17, and this partition has a central circular opening 19 therethrough which forms an outlet for the pulverizing chamber.

A suitable rotor is mounted on the shaft in the pulverizing chamber 16, and in the embodiment illustrated this rotor comprises a large vertical circular disk 20 and a relatively small vertical circular disk 21, both of which are fastened by bolts 23 to a hub 24 keyed to the shaft 11. The small disk 21 carries at its periphery a number of hammers 25, preferably pivotally mounted on the disk by pins 26. These hammers revolve near a central inlet opening 28 located in the side wall of the casing, adjacent to the shaft 11 and through which the coarse material enters the pulverizing chamber. A stationary plate or shelf 29 shaped as a semi-circle is

mounted on the wall of the lower half of the casing just outside of and closely adjacent to the path of the hammers 25 which serves to hold the incoming coarse material in a position to be struck by the hammers and broken up prior to its fine pulverization. On the opposite sides of the large disk 20 and near its periphery I provide a number of impact members or pegs 31 and 32, which are preferably constructed and mounted in the manner disclosed in the patent to Craig No. 1,714,080. The revoluble pegs 32 interfit and cooperate with stationary pegs 33, which are arranged in concentric circles and extend horizontally from the partition 15.

Four U-shaped rejector blades 35 are mounted on the shaft near the outlet 19. These blades serve to separate any coarse particles from the issuing stream of pulverized material and air, and to return them for further pulverization by the pegs 32 and 33. A curved shelf or plate 36 is mounted on the partition 15 and extends horizontally beneath the pegs 32 to protect them from contact with tramp metal, as disclosed in my prior Patent No. 1,763,496. An inverted U-shaped liner plate 37 is supported in the lower part of the casing and extends over the rotor to protect the casing from wear, this construction being likewise fully disclosed in my said prior patent.

A suitable fan 39 is mounted on the shaft 11 in the fan chamber 17, and the peripheral wall 40 of the chamber is shaped as a volute leading to a discharge connection 41. The fan chamber volute is preferably protected by a number of small renewable liner blocks 43 of hard wear resisting material. These blocks are held in place by bolts 44, by liner plates 45 mounted on the outer wall of the fan chamber, and by liner plates 46 and 47 mounted on the fan chamber side of the partition 15.

In order to provide for access to the interior of the apparatus when it is necessary to replace any of the various parts which are subject to wear, I divide the casing 10, preferably along the horizontal axial plane, into a lower portion 50 and an upper portion 51. These parts are formed with flanges 52 at the joint so that they may be firmly bolted together. An eye bolt 53 at the top of the upper casing portion provides a convenient means for attaching a chain hoist or other device when it is desired to open the machine.

The pegs 33 cannot be carried upwardly when the upper portion 51 of the casing is removed, for they would interfere with the revoluble pegs 32 on the rotor as well as with the liner strap 37. In order to avoid this difficulty, I so arrange the various parts that the upper portion of the casing may be raised without disturbing the partition 15, or at least such part of the partition as supports the stationary pegs. For this purpose I preferably construct the partition with a joint extending over the pegs 33, these pegs and all other parts on the partition wall being firmly supported by the lower portion 50 of the casing. This joint is preferably of the overlapping type to prevent any leakage therethrough.

In the preferred embodiment illustrated, the partition 15 comprises a vertical plate or diaphragm 55 integral with the lower portion 50 of the casing and extending upwardly to the horizontal axial plane. A semi-circular portion is cut away at the top of the plate and concentric with the shaft 11 to fit an annular member or ring 56 which provides the central outlet opening from the pulverizing chamber. The ring 56 is fastened to the plate 55 by means of flat head bolts 57 which are countersunk into the liner plates 47 of the fan chamber. The lower portion 58 of the ring (Fig. 2) is separable from the remaining portion so that the ring may be slipped into place or removed without disturbing the shaft.

In order to locate the stationary pegs 33 properly and support them in position, I provide an annular plate 60 having circular openings through which the pegs are inserted. These stationary pegs are preferably provided with thin flanges 61 (Fig. 4) formed on pressed steel ferrules 62, the body of the peg being cast in the ferrule in the manner disclosed in the patent to Riley No. 1,576,472. The plate 60 is supported on the ring 56 and may be rotated thereon to bring the pegs successively to the top for replacement purposes. A flange 64 on the ring (Fig. 1) prevents the plate from slipping off the ring while it is being so rotated. The plate 60 is preferably formed in two sections held together by straps 65 (Fig. 2) so that it may be replaced when necessary without disturbing the shaft. The maximum rigidity of construction is obtained by so locating the plate that the straps 65 are at the top and bottom thereof.

The flanges 61 of the pegs 33 in the lower part of the pulverizing chamber are clamped between the plate 60 and the diaphragm 55 by means of cap screws 67 which extend through the diaphragm and are threaded into the plate. The liner plates 47 have openings to receive the heads of the screws, which are thus protected from wear. These screws are readily accessible for turning by a socket wrench when the upper portion 51 of the casing is removed. The portion of the diaphragm between the plate 60 and the shelf 36 is protected by liner plates 68 fastened in place by bolts 69.

The pegs 33 in the upper portion of the pulverizing chamber are held in place by clamping their flanges between the plate 60 and a backing plate 71 shaped as half of a flat circular ring. This backing plate pref-

erably has a tongue 72 along its lower edge which fits between the ring 56 and a liner plate 73 fastened to the ring by bolts 74. Plate 73 is likewise shaped as half of a flat circular ring, and the lower ends of both plates 71 and 73 extend substantially to the horizontal axial plane. The backing plate 71 is fastened to the plate 60 by means of cap screws 76 threaded into the latter plate.

The backing plate 71 preferably has a tongue 77 along its upper edge, and a vertical diaphragm 78 is provided integral with the upper portion 51 of the casing and in line with the tongue. The fan chamber liner plates 46 and pulverizing chamber liner plates 80 are fastened to this diaphragm by bolts 81, and these liner plates project downwardly at each side of the tongue 77, this forming an overlapping joint of the tongue and groove type. This prevents any leakage of air or pulverized material through the joint, and renders the whole partition 15 very rigid when the machine is completely assembled.

The operation of this apparatus, so far as the pulverization of material is concerned, is substantially the same as that disclosed in the patent to Riley et al. No. 1,759,134. Coarse material is delivered through the inlet opening 28 and broken up by impact with the hammers 25, which throw the crushed material upwardly. Any tramp metal present drops to the bottom of the chamber 16, and the remaining material is carried around the edge of the disk 20 by the air current produced by the fan 39. This material is pulverized finely by the action of the pegs 32 and 33, and passes through the opening 19 into the fan chamber 17 and out through the discharge opening 41 to a suitable storage bin or place of use. The rejector blades 35 prevent the passage of coarse particles through the opening 19.

After long continued use, some of the pulverizing elements of the machine will become so worn as to require replacement. By removing the upper portion 51 of the casing, all such parts are made readily accessible. To replace the stationary pegs 33, it is necessary to take out the cap screws 67 and 76, and lift off the backing plate 71. The pegs may then be slipped out of the annular plate 60, which may be rotated on the ring 56 to bring the pegs successively to the top. New pegs are installed by reversing this procedure.

It will be seen that this invention provides a much more compact construction than anything heretofore disclosed for this type of pulverizing apparatus. The floor space required is reduced and the shaft can be made very short and rigid, for the fan chamber is located very close to the pulverizing chamber and is only separated therefrom by a single thin partition.

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

1. A pulverizing apparatus comprising a casing, a rotatable fan and a pulverizing rotor mounted within the casing and spaced apart, said casing being divided into an upper and a lower portion, a substantially vertical partition supported by the lower portion of the casing and located between the fan and the rotor, said partition having an opening therethrough for the passage of pulverized material, pulverizing elements mounted on the partition and extending toward the rotor, and means for fastening the pulverizing elements to the partition independently of the upper portion of the casing.

2. A pulverizing apparatus comprising a casing, a substantially horizontal rotatable shaft extending therethrough, a fan and a pulverizing rotor mounted on the shaft within the casing and spaced apart, said casing being divided into an upper and a lower portion, a flat annular plate surrounding the shaft and located between the fan and the rotor, means connected with the lower portion of the casing for supporting the plate in position, pulverizing elements mounted on the plate and extending toward the rotor, and means for fastening said elements firmly to the plate independently of the upper portion of the casing, whereby said upper portion may be removed without loosening the elements, the supporting means for the plate being so constructed that the plate may be revolved to bring the lower pulverizing elements to the top for replacement purposes.

3. A pulverizing apparatus comprising a casing, a substantially horizontal rotatable shaft extending therethrough, a fan and a pulverizing rotor mounted on the shaft within the casing and spaced apart, said casing being divided on substantially the horizontal axial plane into an upper and a lower portion, a flat annular plate surrounding the shaft and located between the fan and the rotor, said annular plate having openings therethrough, flanged pulverizing pegs mounted in said openings and extending toward the rotor, means including a diaphragm plate in the lower portion of the casing for supporting the annular plate and clamping the flanges of the pegs in the lower portion of the casing, and a separate backing plate arranged to clamp the flanges of the pegs in the upper portion of the casing, said upper portion being removable without disturbing the backing plate, and the annular plate being so mounted that it may be revolved to bring the lower pegs to the top for replacement purposes.

4. A pulverizing apparatus comprising a casing, a substantially horizontal rotatable shaft extending therethrough, a fan and a pulverizing rotor mounted on the shaft with-

in the casing and spaced apart, said casing being divided on substantially the horizontal axial plane into an upper and a lower portion, a vertical diaphragm plate in the lower portion of the casing and located between the fan and the rotor, a ring fastened to the diaphragm plate and surrounding the shaft to form a central passage for the pulverized material, a flat annular plate rotatably supported on the ring at the rotor side of the diaphragm, said annular plate having openings therethrough, flanged pulverizing pegs mounted in said openings and extending toward the rotor, screws extending through the diaphragm plate and threaded into the annular plate to clamp the flanges of the pegs in the lower portion of the casing between these parts, a backing plate mounted above the ring and shaped as half of a flat circular ring, screws extending through the backing plate and threaded into the annular plate to clamp the flanges of the pegs in the upper portion of the casing between these parts, and means on the upper portion of the casing which provides an overlapping joint extending over the pegs and prevents passage of pulverized material into contact with the fan except through the central passage.

Signed at Worcester, Massachusetts, this thirtieth day of October, 1930.

L. V. ANDREWS.