Nov. 2, 1943. H. H. HARRIS ET AL 2,333,247

HAMMERMILL DISCHARGE RECEIVER

Filed Dec. 31, 1940

Fig. 1.

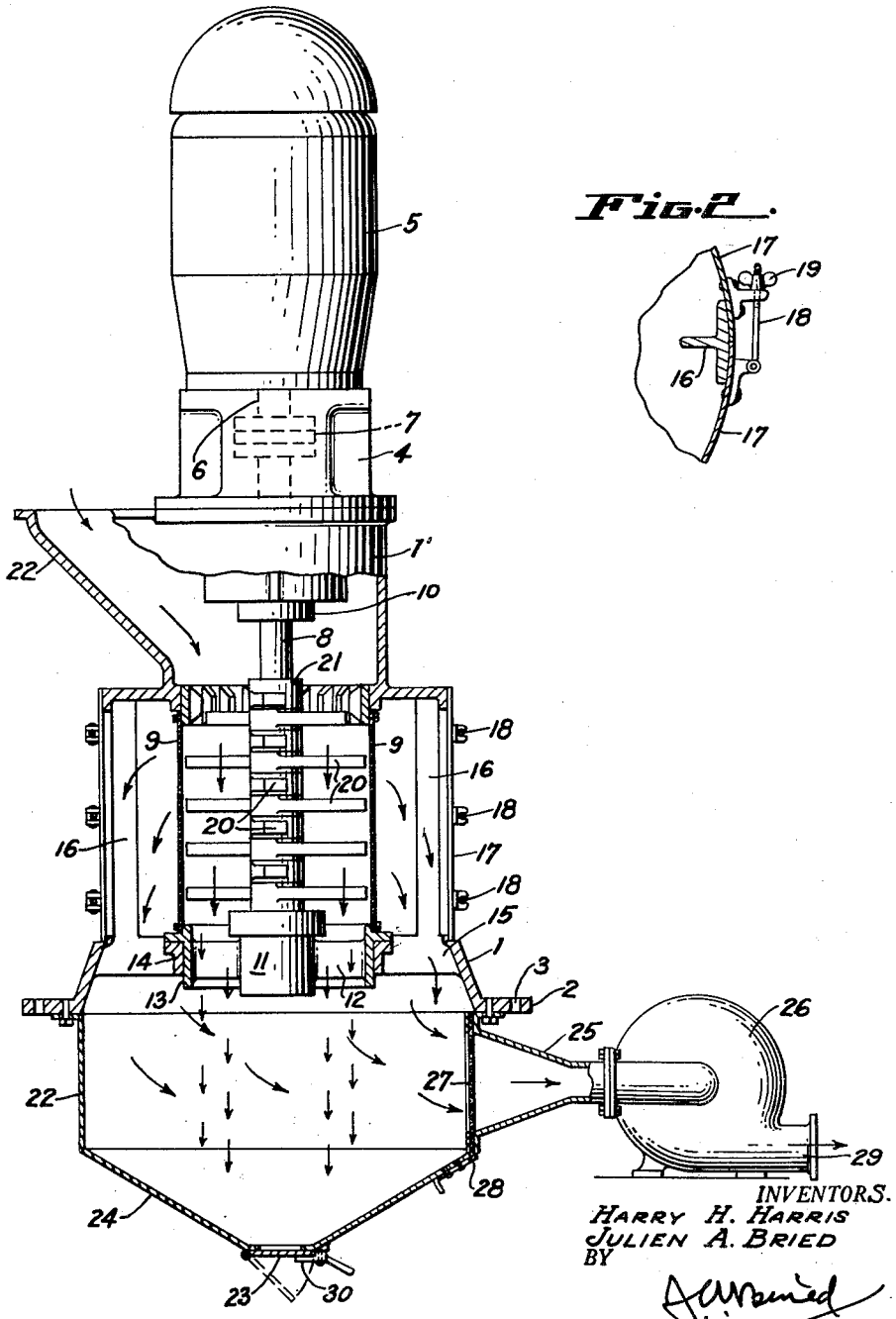


Fig. 2.

INVENTORS.
HARRY H. HARRIS
JULIEN A. BRIED
BY

ATTORNEY.

Patented Nov. 2, 1943 2,333,247

UNITED STATES PATENT OFFICE

2,333,247

HAMMER-MILL DISCHARGE RECEIVER

Harry H. Harris, Palo Alto, and Julien A. Bried, Berkeley, Calif., assignors to Enterprise Engine & Foundry Company, San Francisco, Calif., a corporation of California

Application December 31, 1940, Serial No. 372,620

5 Claims. (Cl. 83—11)

This invention relates to vertical hammer mills or disintegrators and particularly to such mills having a screen through which the finely reduced material passes while the oversize or rejects of the screen pass through the hammering chamber. The object of the invention is to provide improved means for receiving and separating the products of the mill.

In the accompanying drawing the mill chosen to illustrate the invention is a vertical hammer mill of common construction and with our improvement cooperating with the lower or discharge end of the mill.

Fig. 1 is a vertical central section of the mill showing all of its main parts, and the relation of our improvement thereto.

Fig. 2 is an enlarged detail showing one of the mill casing clamps.

Briefly described, our invention comprises dropping the ground and screened material as well as the unground and unscreened material, generally termed "rejects" or "oversize," all into a common receiver at the lower end of the mill and pumping out the fines from a lateral opening while permitting the oversize to accumulate until such time as they may conveniently be dropped out of a door at the bottom.

In the drawing the vertical hammer mill comprises the old and well known features of a frame 1 having an outwardly projecting circular supporting flange 2 with bolt holes 3 for securing it to a foundation, while at the upper end the frame is of reduced diameter as at 1', secured to the upper end of which is a spacing frame 4, in turn supporting a motor 5, the shaft 6 of which is coupled at 7 to the rotor shaft 8 of the mill. The rotor shaft extends downwardly through a cylindrical chamber formed by curved screen sections 9, and the shaft is rotatably positioned in bearings 10 and 11, the latter of which receives the entire lower end of the shaft and is supported by ribs or spider arms 12 extending radially from a circular flange 13 in turn supported within a circular flange 14 connected to frame 1 by radially extending ribs or spider arms 15.

The mill frame 1 includes vertical members 16 spaced outwardly from the screen shell 9 and around which members is a sheet metal enclosing casing 17 made in two or more sections and clamped in place around the mill as by pivot bolts 18 and wing nuts 19 as best shown in Fig. 2, or otherwise removably secured or hinged thereto.

Within the screen chamber the shaft 8 is provided with the usual beater arms or so-called hammers 20 which project radially from the shaft, or rather from a hub or hub sections 21 suitably secured to the shaft, and which beater arms may be of any shape, size, or length, fixed or pivotally mounted, and in any desired arrangement, as commonly used in mills of this type for beating and disintegrating material fed into the upper end of the screen chamber from a feed chute 22 so that from the rapid revolution of the beater arms the material is broken up or disintegrated to an extent depending on the nature of the material, the shape, length and speed of the beaters. The finely divided material is thrown through the openings in the screen shell 9 surrounding the rotor and falls in the direction of the arrows to pass downwardly out of the spaces between ribs or spider arms 15, while the oversize pieces or rejects, together with any unbreakable pieces of material which have resisted the impacts of all of the beater arms; will fall through the rotor chamber or central area embraced within the screen to pass through the spaces between ribs or spider arms 12 as indicated by the smaller arrows.

In some prior mills of this type all of the material both screened and unscreened was permitted to fall from the bottom (see Patent #291,191) while in others the space surrounding bearing 11 has been closed off adjacent the bottom of the bearing by a plate to form a sump or chamber to entrap or catch the oversize or ungrindable pieces of material, and which had to be removed from time to time (see Patent #2,082,419), while in some other mills of this general type and in rotary screening apparatus generally, separate discharge chutes for the ground material and the unground material were provided. (See Patents, 1,343,439, 1,262,530, and 500,916).

However, we have found that considerable of the properly ground or disintegrated material also descends through the rotor area, especially that which strikes the substance of the screen instead of the screen holes when hurled outward by the rapidly revolving beaters, and it is by reason of this fact that we have provided a relatively large bowl-shaped receiver 22 secured to the lower flange 2 of the mill so as to extend under the whole of the outlet space both for screened material as well as unscreened material so that all material passing through the mill will fall into the receiver. The receiver is preferably provided with a slanted bottom 24 leading to a discharge door 23 hinged at the lowest part of the bottom and normally held closed by a hand operated latch 30.

At a point elevated materially above the lowest part of the bottom 24 is a side outlet opening into a pipe 25 which leads to a centrifugal discharge fan or pump 26 driven by any suitable source of power. Covering the side outlet from the receiver 22 is a sheet of screening material 27 which preferably slides in or out of position through a suitable opening in the bottom and is normally held in place as by a hand latch 28.

By the construction described, ejecting or fan pump 26 is kept running while material is being fed into the mill and as the ground and screened material and also all such fines as could pass through the screen but failed to meet its openings, falls into the receiver 22 it is as quickly drawn through pipe 25 by the pump and ejected to any desired point from the pump outlet 29, while the larger particles and any unbreakable materials such as nails, etc., which might have entered with the feed, will fall to the slanted lower part of the receiver away from the side outlet to the pump and may be dumped occasionally through door 23, or if the material contains a large percentage of ungrindable materials or rejects, the door 23 may be left open or the opening directed into any suitable discharge pipe or chute for continuous discharge of such rejects.

The provision of a screen 27 at the side suction opening insures against any oversize light weight particles from being drawn into the ejecting fan, this screen of course being suitably chosen to suit the intended use of the material.

By the above construction it will be seen that not only are the fines which have passed through the cylindrical screen drawn out of the suction opening at the side of the receiver 22, but also the fines from the rotor chamber within the cylindrical screen, and since all of the fines are separated from the rejects while suspended in the air in receiver 22 they never fall to the bottom of the receiver, and only the rejects fall to the bottom to settle to its lowest part or continuously pass out of its opening if door 23 is open or omitted.

Having thus described our improved construction and method of handling the discharge from a hammer mill of this type what we claim is:

1. In a vertical hammer mill having a rotor with laterally extending hammers revolvable within a vertically positioned cylindrical screen, and a mill outer wall or casing surrounding and spaced outwardly from the screen, whereby material fed into the upper end of the cylindrical screen will be distintegrated by the revolving hammers and hurled outwardly through the screen to fall from the lower end of the space between the screen and the mill casing, the improvement which comprises providing a common receiver at the lower end of the mill forming a closed continuation of the mill outer wall or casing and into which receiver the disintegrated and screened material from the lower end of the space between the screen and the casing as well as the unground material or rejects from within the lower end of the screen are adapted to freely fall vertically, a side opening in said receiver with the receiver extending below said side opening, and means for applying suction to said side opening to withdraw the fines latterly during falling, while permitting the heavier particles and ungrindables to freely fall further down into the receiver beyond the substantial influence of said suction.

2. In a structure as set out in claim 1 said receiver provided with a conical bottom with its small end directed downwardly and with a rejects discharge opening at the lowest point.

3. In a structure as set out in claim 1 a substantially vertically disposed screen across said side opening arranged to permit any particles not passing the screen to fall back into the receiver.

4. In a vertical hammer mill having a rotor with laterally extending hammers revolvable within a vertically positioned cylindrical screen, and a mill outer wall or casing surrounding and spaced outwardly from the screen, whereby material fed into the upper end of the cylindrical screen will be disintegrated by the revolving hammers and hurled outwardly through the screen to fall from the lower end of the space between the screen and the mill casing, the improvement which comprises providing a common receiver at the lower end of the mill forming a closed continuation of the mill outer wall or casing and into which receiver the disintegrated and screened material from the lower end of the space between the screen and the casings as well as the unground material or rejects from within the lower end of the screen are permitted to fall vertically, a side opening in said receiver with the receiver extending below said side opening, and means for applying suction to said side opening to withdraw the fines latterly during falling, while permitting the heavier particles and ungrindables to freely fall further down into the receiver beyond the substantial influence of said suction, said receiver provided with a bottom substantially below said side opening and slanted downwardly away therefrom.

5. In a vertical hammer mill having a vertical shaft with a rotor thereon with laterally extending hammers operating within a cylindrical shell so as to disintegrate material fed into the upper end of the shell into fine and relatively heavier particles, the improvement which comprises a receiver at the lower end of the mill forming a closed continuation thereof and into which the fine and relatively heavier particles from the mill fall freely, a side opening in said receiver above the bottom end thereof, a screening element over said opening and means for applying suction to said side opening to withdraw the fine particles laterally during falling, while permitting the heavier particles to fall in the receiver beyond the influence of said suction.

HARRY H. HARRIS.
JULIEN A. BRIED.