June 16, 1942. C. J. P. HOEHN 2,286,545

DISINTEGRATING MILL

Filed May 25, 1940 2 Sheets-Sheet 1

Fig-1-

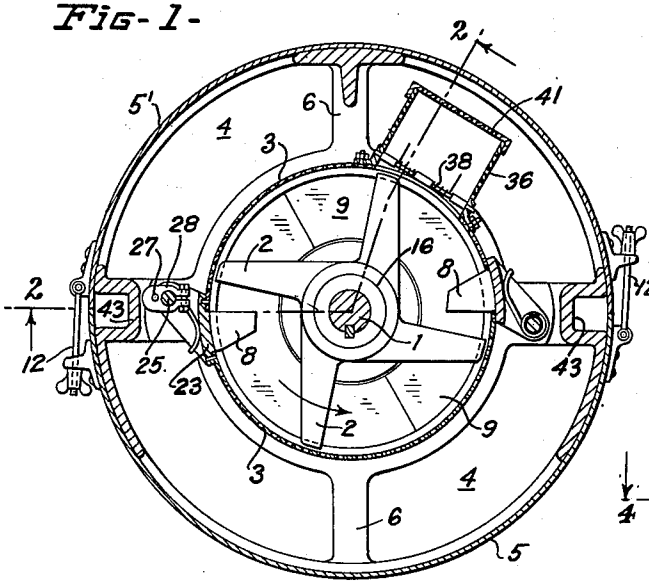
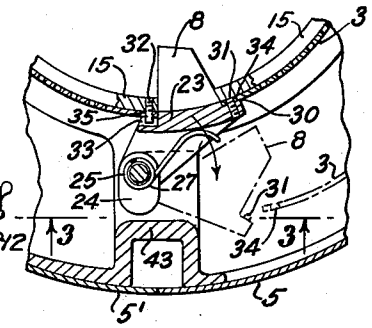


Fig-4-



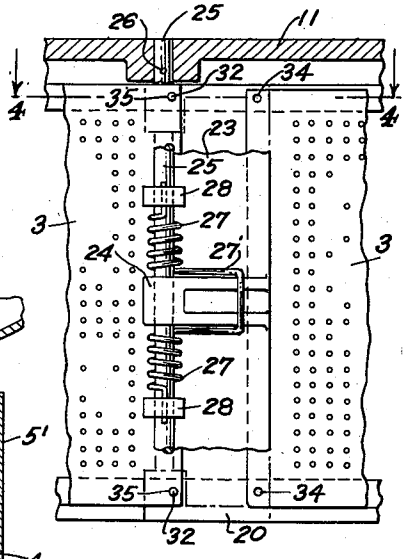
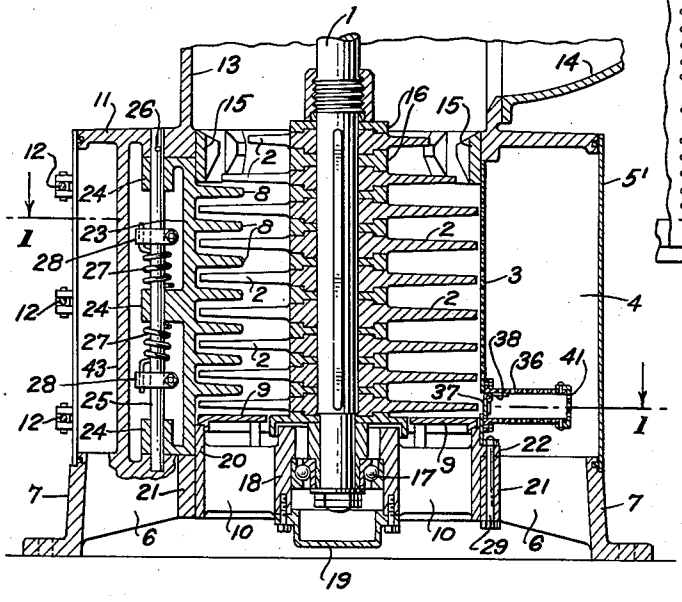


Fig-3-

Fig-2-



INVENTOR.
CHARLES J. P. HOEHN
BY J. A. Breed
ATTORNEY.

June 16, 1942. C. J. P. HOEHN 2,286,545

DISINTEGRATING MILL

Filed May 25, 1940 2 Sheets-Sheet 2

Fig-5-

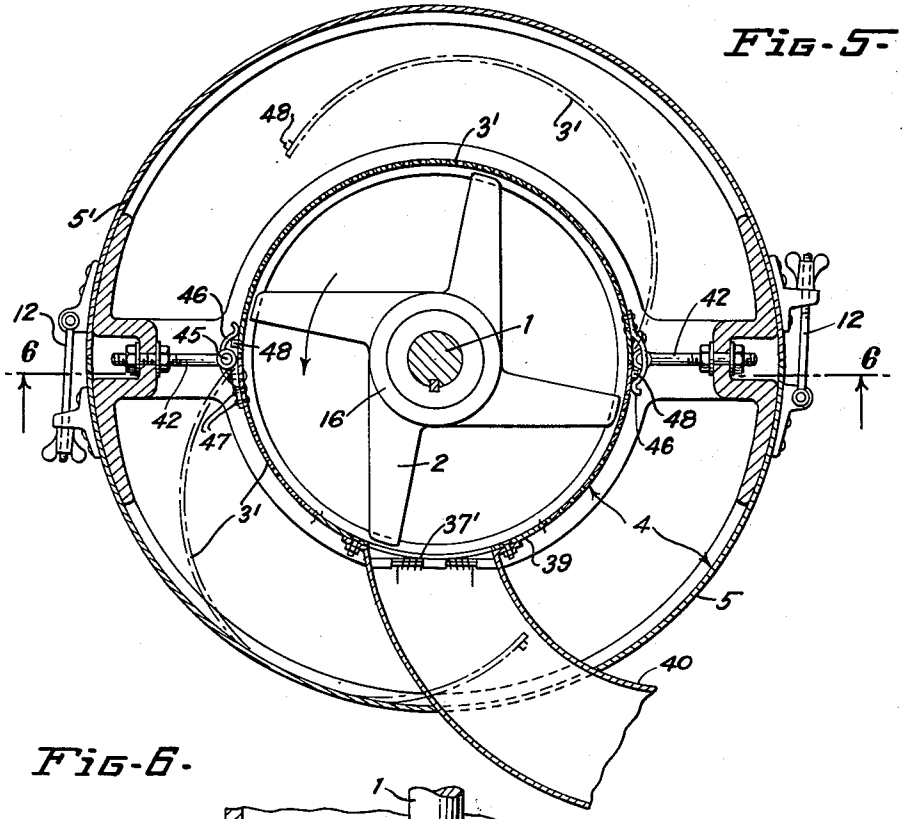
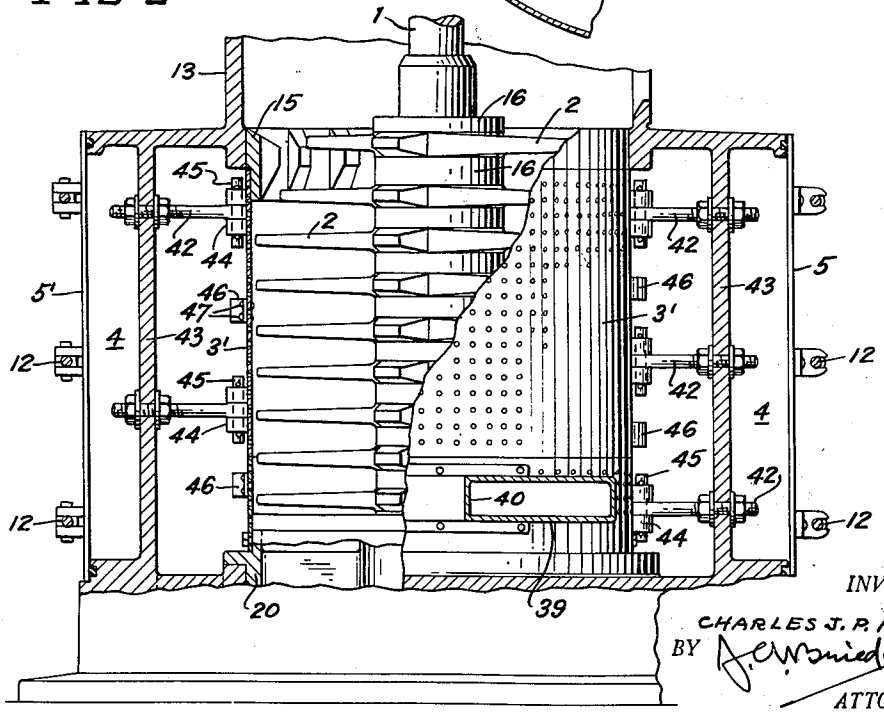


Fig-6-



INVENTOR.

CHARLES J. P. HOEHN

BY

ATTORNEY.

Patented June 16, 1942 2,286,545

UNITED STATES PATENT OFFICE

2,286,545

DISINTEGRATING MILL

Charles J. P. Hoehn, San Francisco, Calif., assignor to Enterprise Foundry Company, San Francisco, Calif., a corporation of California

Application May 25, 1940, Serial No. 337,260

8 Claims. (Cl. 83—11)

This invention relates to mills for disintegrating various materials passed through them, particularly such mills of the type generally termed hammer mills which have a high speed rotor carrying a series of beater arms for striking the material to be disintegrated or pulverized, and the principal object of the invention is to provide means for preventing injury to such mills from stray pieces of material entering the mill which cannot be ground, such as heavy pieces of metal, iron bolts and nuts, and the like. Also to separate such ungrindable objects from the material being ground.

Other features and advantages of my improvements will appear in the drawings and in the accompanying description.

In the drawings, the figures are all portions of a vertical type of hammermill showing only sufficient of the adjacent parts to make the invention clear and understandable.

Figure 1 is a horizontal cross section of a vertical hammermill as seen from the line 1—1 of Figure 2, and showing outwardly movable screen sections and comb-teeth, and stray iron receiver.

Figure 2 is a vertical section of the mill as seen from the line 2—2 of Figure 1.

Figure 3 is an enlarged vertical fragmentary section of Figure 1 as seen from the line 3—3 of Figures 1 and 4.

Figure 4 is a horizontal cross section of Figure 3 as seen from the line 4—4 thereof and showing some adjacent portions of the mill.

Figure 5 is a horizontal cross section of a mill like that of Figure 1 omitting the comb-teeth and showing a modification in the mounting of the outwardly movable screen sections and stray iron receiver.

Figure 6 is a vertical cross section of the mill of Figure 5 as seen from the line 6—6 thereof but showing the rotor in full and with portion of the screen in full.

Before describing the drawings in detail, it may be stated that the general construction of the mill is of the well known type in which a vertical shaft 1, driven by a motor or pulley (not shown) carries a series of more or less radially extending hammers or beater arms 2 which revolve with the shaft at high speed within a cylindrical perforated shell or screen 3 arranged close to the outer ends of the rotating arms and through the openings in which screen the finely divided material struck by the arms passes to an outer space 4 in turn surrounded by an outwardly spaced sheet metal casing 5 to fall downward and out of the lower end of the mill through the spaces between radial ribs 6 of the lower mill frame or foot flange ring 7 and which ribs form a spider which supports the lower end of the shaft or rotor as well as the lower end of the screen.

Besides the above main operating parts of the mill are normally fixed comb-teeth 8 which are firmly mounted adjacent the screen and project inwardly between the rotating arms or hammers 2 to aid in disintegrating the material thrown violently against them by the rotating hammers.

Generally the lower end of the rotor space, or space within the cylindrical screen is closed off by a loose centrally divided plate 9 which may be solid or perforated and in the latter case simply forms a screen bottom for the rotor space through which the fine materials pass to fall between inner spider arms or ribs 10 to join the material falling from space 4 as it leaves the mill.

In the present showing the outer casing is shown as made of two half-cylinders 5, 5' drawn together tightly against the lower 7 and upper 11 mill frame flanges by means of pivoted wing bolts 12. The upper end 13 of the mill frame is open to the rotor space and formed into a leading-in chute 14 for guiding material to the upper end of the rotor.

In the instant showing the two upper sets of beater arms are shorter than the remainder and are surrounded with a thick-toothed pre-breaker ring 15 and the beater arms are split and are specially secured to the shaft by means of confronting cups 16 engaging over their hubs as shown and claimed in my copending patent application filed under Serial #225,739 on August 19, 1938.

The rotor shaft is supported at its upper end by a bearing not shown, and at its lower end in a bearing 17 mounted within a circular housing or cup 18 formed integral with inner spider 10 and is closed at its bottom by a removable cap 19. The outer ends of the spider 10 are integrally secured to a ring 20 which projects above a ring 21 of outer spider 6 and is also outwardly flanged as at 22 to rest on 21 and secured thereto as by bolts 29.

The improvements constituting the present invention comprise means for preventing injury to the mill parts by stray iron pieces which may accidentally find their way into it with the material being treated, and to this end I provide means to permit the comb-teeth to swing outwardly away from the beater arms if struck an excessively heavy blow as by a piece of iron, also provide for the cylindrical screen sections to move or swing outwardly from excessive pressure due

to such foreign material being hurled outward by the rotor, and further provide a side or tangentially arranged exit or receiver for such material if it manages to get to the lower part of the rotor without opening the screen, and as would be the case with small bolts and nuts.

In carrying out these improvements the comb-teeth **8** are preferably arranged in two or more vertical rows or sets around the cylindrical screen **3** and either secured to or formed integrally with a vertical bar or plate **23** provided with outwardly extending hubs **24** pivoted on a vertical shaft **25** itself secured against rotation as by a pin **26** passing through the shaft into the frame of the mill, or by any other suitable means, while coiled about the fixed shaft **25** is a spring **27** with its free ends fulcrumed in collars **28** clamped to the shaft and with its intermediate portion **27'** bearing against the outer side of bar **23**. The strength of the spring is such as to resiliently force the comb-teeth inwardly and hold them in place against any normal outward pressure of grinding or disintegrating action of the rotor, but adapted to yield when undue pressure is put upon them, and move outwardly away from any piece of iron or bolt which might be hurled against them by the revolving hammer arms.

Cylindrical screen sections **3** are of a length so that their upper margins overlie the breaker ring **15** (which is suitably secured in place by means not shown) and the lower margins overlie the inner spider ring **20** to thereby arcuately position the screens with reference to the outer ends of the hammer arms, and the vertical edges of the screen plates are overlapped by the vertical margins of comb-tooth plates **23** which are recessed to receive them as indicated in Figures 1 and 4, but most clearly seen in the latter figure at **30**, so that the inward spring pressure of springs **27** against comb-tooth plates **23** also forces the screen plate sections inwardly against their end supporting rings.

Besides the above the screens are further positioned by aligning or dowel pins at their four corners, two of which pins **31** for each screen plate are secured to the comb-tooth plate **23** and extend inwardly therefrom and freely into matching holes **34** in the upper and lower corners of the screen plate which come last in the direction of rotation of the rotor, and the opposite two (**32**) of which pins are secured in the upper and lower rings **15** and **20** and project outwardly into free fitting holes **35** in the screen plates and further into a slot or groove **33** formed in the margin of plate **23**. By this means, upon outward movement of the comb-teeth to the dotted position shown in Figure 4 the pins **31** can separate from the screen plate as also indicated in this view in dotted lines, or if retained on pins **31** as the comb-plate swings out the opposite edge will free itself from pins **32** which are fixed in screen positioning rings **15** and **20**. Thus any large piece of metal entering the mill will at once force the comb-teeth and screen sections outward instead of destroying the hammers, comb-teeth and screen plates, and will fall into the outer space **4** together with the disintegrated product from which it will be removed by final screening of the product.

As smaller pieces of metal will not be able to open the screen as above described, I provide a peripherally positioned receiver **36** which is positioned just above the bottom plate **9** of the mill and fitted with an outwardly opening spring closed door **37** which will open against the pressure of smaller pieces of metal finding their way to the lower set of hammer arms and permit the stray metal and other ungrindable articles to get out of the path of the hammers. The spring closure of the door **37** is shown as a spring hinge **38** but may take any form functioning in the manner set out. The door is of course stopped against inward movement into the path of the revolving hammer arms as indicated.

Receiver **36** if relatively small, may be secured directly to a screen section over an opening cut therein as indicated for swinging out with the screen, or secured to a separate fixed plate either perforated or plain as shown at **39** in Figure 6 and wherein the stray iron receiver takes the form of a curved conduit **40** fixed in position and extending through the outer casing **5** so as to provide a continuous discharge for stray iron and metal as well as all other ungrindable objects. The conduit **40** may of course extend to any desired point of final discharge.

In Figures 1 and 2 the stray iron receiver **36** is indicated as having perforate or screen walls to permit any finely ground material which may enter it to pass out freely to space **4**, and is also shown with a removable cap **41** to provide for cleaning it out upon opening one side of casing **5**.

In Figures 5 and 6 most of the already described is the same and similarly enumerated, but the pivotal mounting of the outwardly swingable screen plates is somewhat different, for here the advance vertical margins of the screen sections (those at which the revolving hammer arms first arrive) are hingedly pivoted to rigid supporting eye bolts **42** firmly mounted on the vertical stays **43** of the mill frame. This mounting includes hinge lugs **44** suitably secured to the screen sections **3'** and pivotally connected by pins **45** to the eye bolts, and also several short leaf springs **46** secured at one end as by rivets **47** to the same screen plate arched to extend over the free margin of the adjacent plate as well as over a lug or pin **48** projecting therefrom and resiliently force the adjacent plate in position against its upper and lower supporting rings **15** and **20**.

By the construction described for Figure 5 the screen plates **3'** are free to swing outwardly on their hinged edges to the dotted position upon any excessive pressure from within sufficient to overcome the springs engagement over lugs **48**, such pressure as would be caused by a heavy object such as a bolt or other unbreakable object urged against the screens by the revolving rotor.

The conduit or side outlet **40** for smaller pieces of stray metal is provided with a normally spring closed door **37'** as described for Figures 1 and 2 at **37** and **38**, and fixed screen section **39** to which the conduit **40** is secured may be perforate or imperforate and of course detachably secured in place as by screws not shown.

Having thus described my improvements in a mill of this type what I claim is:

1. In a vertical hammermill having an outer casing and a sectional substantially cylindrical screen spaced within the casing and a rotor within the screen with beater arms extending outwardly to pass between a series of relatively fixed comb teeth, the improvement which comprises a vertically disposed bar or plate to which the comb teeth are secured provided with means pivotally mounting the bar or plate for swinging said comb teeth outwardly from the screen into the space between the casing and the screen, and spring means normally urging said plate or bar

with its comb teeth inward to operating position with said screen.

2. In a vertical hammermill having an outer casing and a sectional substantially cylindrical screen spaced within the casing and a rotor within the screen with beater arms extending outwardly to pass between a series of relatively fixed comb teeth, the improvement which comprises a vertically disposed bar or plate to which the comb teeth are secured provided with means pivotally mounting the bar or plate for swinging said comb teeth outwardly from the screen into the space between the casing and the screen, spring means normally urging said plate or bar with its comb teeth inward to operating position, and means on said plate or bar engaging the screen sections normally holding them in operative position with said screen.

3. In a vertical hammermill having an outer removable casing and a sectional substantially cylindrical screen vertically spaced within the casing and a rotor within the screen with outwardly extending beater arms, the improvement which comprises providing pivotal means whereby at least one of said screen sections may yield to excessive pressure from within and swing outward into the space between the rotor and the outer casing and latch means normally holding the sections against such swinging movement, and an outwardly opening pocket on one of the pivotally mounted screen sections to swing outward with the section.

4. A down feed vertical hammermill comprising a vertically disposed rotor with horizontally extending beater arms, and a vertically disposed substantially cylindrical screen surrounding the rotor and spaced within an outer removable casing shell, said screen being vertically divided into segments, means whereby at least one of the screen segments may yield to excessive pressure from within and move outwardly into the space between the rotor and the outer casing, and yieldable latching means normally holding the movable screen segment against such movement yet permitting it to move outwardly upon such excessive internal pressure.

5. A down feed vertical hammermill comprising a vertically disposed rotor with horizontally extending beater arms, a vertically disposed substantially cylindrical screen surrounding said rotor and spaced within an outer removable casing shell, said screen being vertically divided into segments, pivotal means whereby at least one of the screen segments may yield to excessive pressure from within and swing outwardly into the space between the rotor and the outer casing, and yieldable latching means normally holding the movable screen segment against such swinging movement yet permitting it to move outwardly upon such excessive internal pressure.

6. A down feed vertical hammermill comprising a vertically disposed rotor with horizontally extending beater arms, a vertically disposed substantially cylindrical screen surrounding said rotor and spaced within an outer removable casing shell, said screen being vertically divided into segments, pivotal means whereby at least one of said screen segments may yield to excessive pressure from within and swing outwardly into the space between the rotor and the outer casing, yieldable latching means normally holding the movable screen segment against such swinging movement yet permitting it to move outwardly upon such excessive internal pressure, a fixed cylindrical shell section at the lower end of a screen segment provided with and a side opening at a point adjacent the bottom of the rotor operating zone, said opening normally closed by a perforated cover accessible from the space between the cylindrical screen and the outer casing upon removal of the casing.

7. A down feed vertical hammermill comprising a vertically disposed rotor with horizontally extending beater arms, a substantially cylindrical screen surrounding the rotor forming a screened chamber and spaced within an outer removable casing shell and into the upper end of which chamber material to be disintegrated is fed, a side door opening in said screened chamber near the lower end of the screen and a perforated pocket extending outwardly from said door opening accessible from the space between the screen and the outer casing upon removal of the latter.

8. A down feed vertical hammermill comprising a vertically disposed rotor with horizontally extending beater arms, a substantially cylindrical screen surrounding the rotor forming a screened chamber and spaced within an outer removable casing shell, and into the upper end of which chamber material to be disintegrated is fed, a side door opening in said screened chamber near the lower end of the screen, and a conduit extending from said side door opening through the space between the screen and the outer casing and through the outer casing.

CHARLES J. P. HOEHN.