Feb. 27, 1934. A. J. WEINIG 1,948,606

SEPARATING APPARATUS

Filed Jan. 12, 1931 3 Sheets-Sheet 1

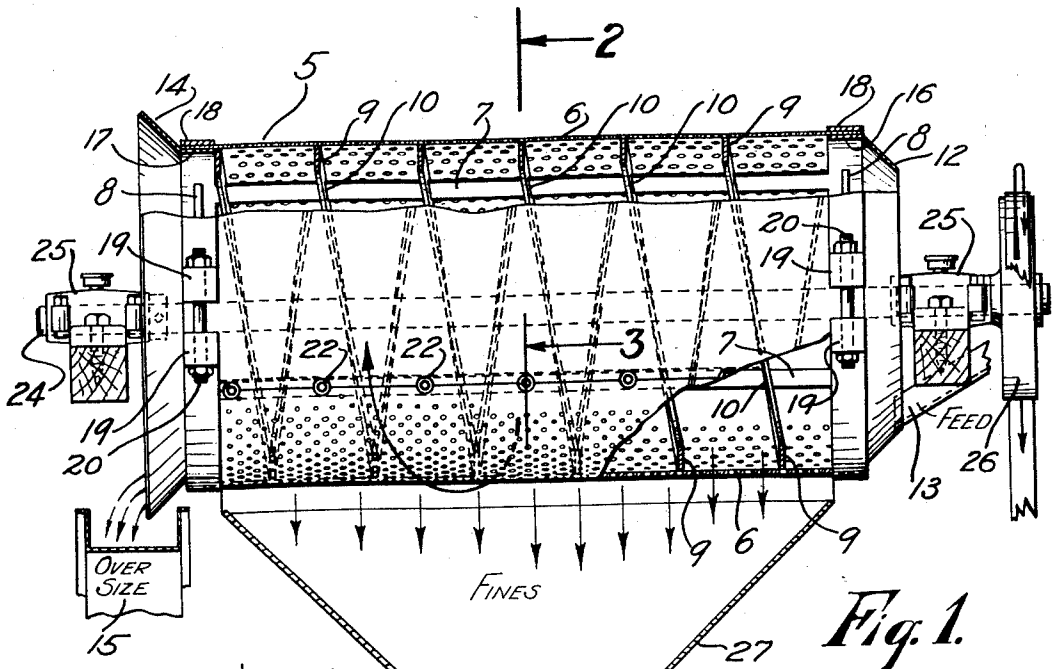



Fig. 1.

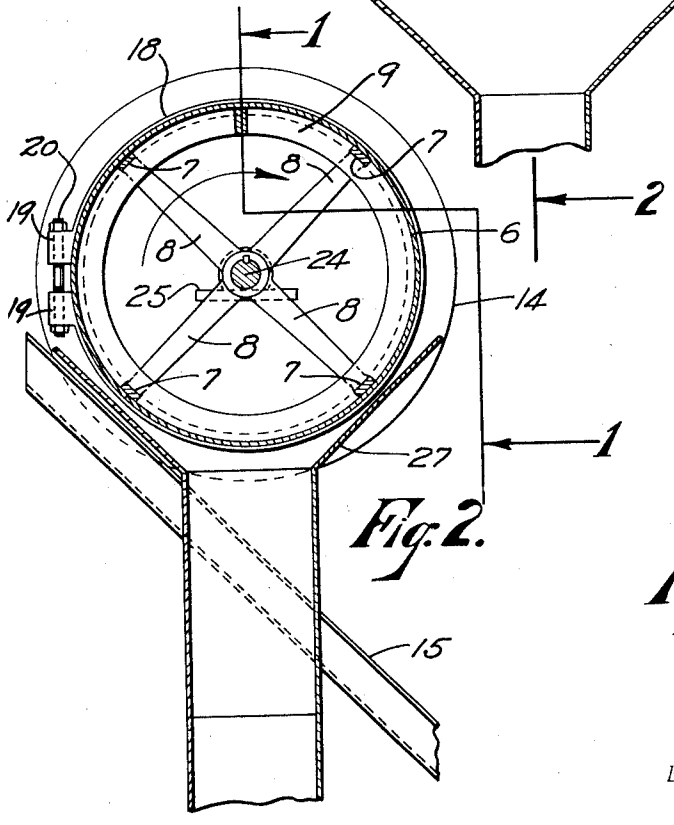



Fig. 2.

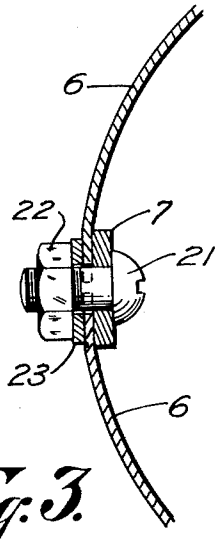



Fig. 3.

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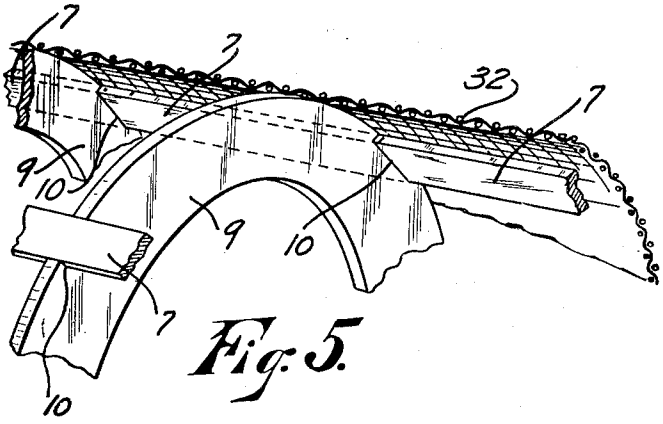



Fig. 5.

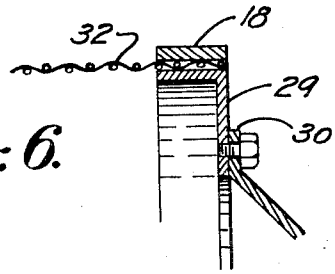



Fig. 6.

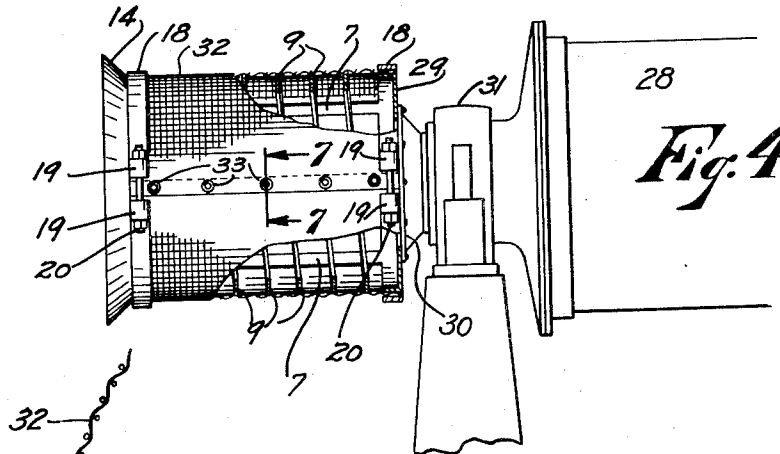



Fig. 4.

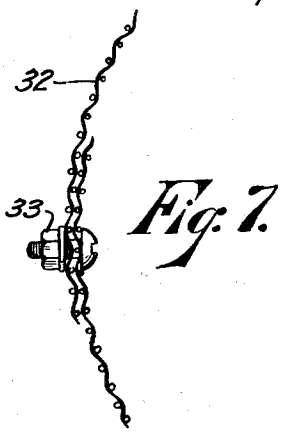



Fig. 7.

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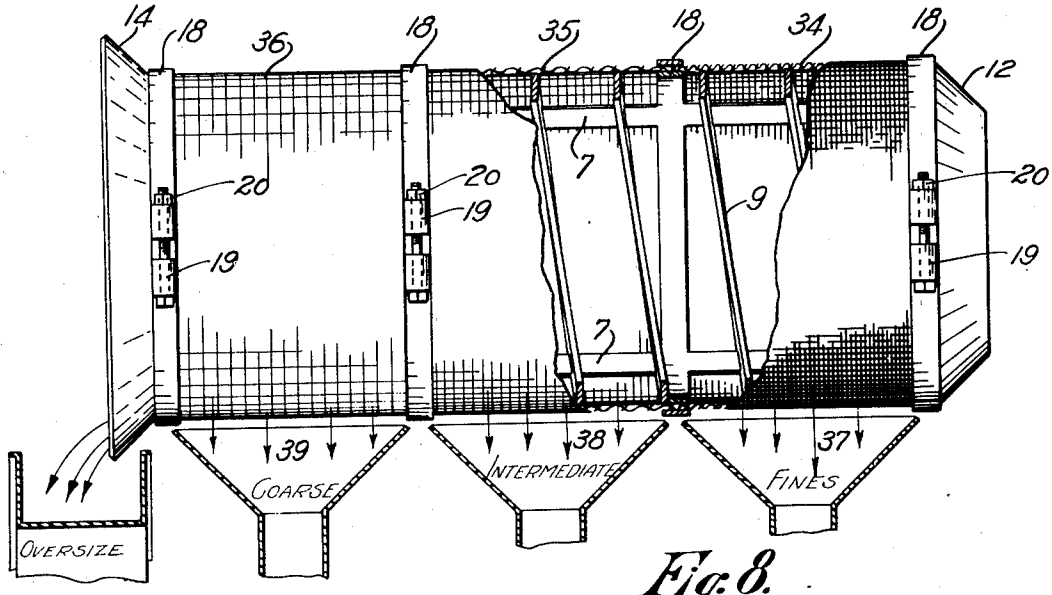



Fig. 8.

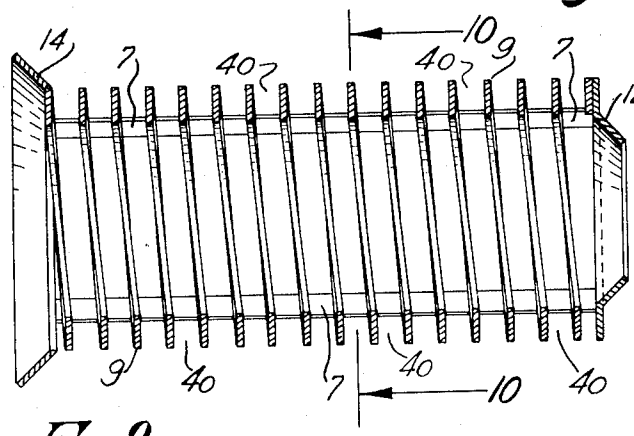



Fig. 9.

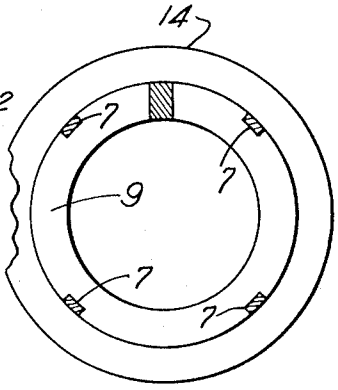



Fig. 10.

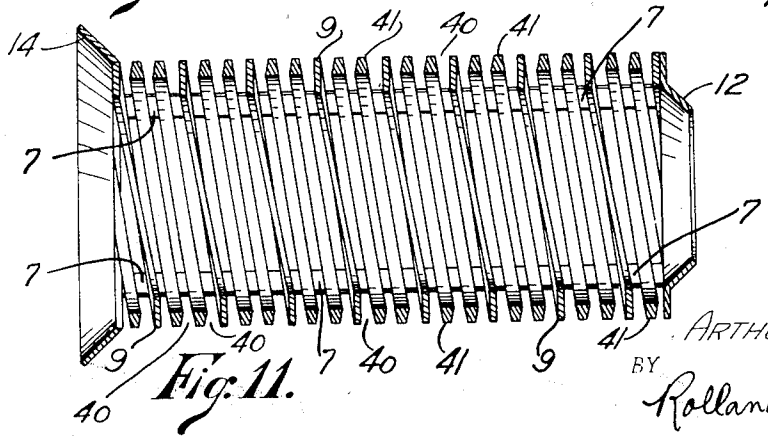



Fig. 11.

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# UNITED STATES PATENT OFFICE

1,948,606

## SEPARATING APPARATUS

Arthur J. Weinig, Golden, Colo.

Application January 12, 1931. Serial No. 508,088

2 Claims. (Cl. 209—288)

This invention relates to apparatus for separating particles of comminuted materials according to their sizes and it is an object of the invention to provide a rotary trommel having an open peripheral wall and interiorly thereof, a helical blade to convey material progressively in an uninterrupted course from a feed-end of the trommel to a discharge end of the same.

The device is particularly adapted for sorting comminuted ores, and it is another object of the invention to provide a trommel of the above described character in combination with a rotary disintegrating mill for the purpose of automatically conveying the discharge of the mill to a point of delivery and separating the material while it is being conveyed, into different sizes for subsequent treatment in a process of extracting minerals from their ores.

The apparatus is also adapted for sizing coals and as such, it provides a convenient means for separating the coal into sizes.

A further object of the invention resides in providing a separating apparatus of the above described character in which the peripheral surface of the trommel is composed of a screen through which the finer particles of the material pass, for their separation from an oversize delivered at the discharge end of the trommel, and still other objects of the invention, chiefly relating to details of constructions, will appear in the course of the following description made with reference to the accompanying drawings.

In the drawings, in the several views of which like parts are similarly designated,

Figure 1 represents a sectional side elevation of apparatus embodying the novel features of the invention in a cylindrical trommel, the outer wall of which is composed of a screen,

Figure 2, a transverse section in the plane indicated by the line 2—2, Figure 1,

Figure 3, an enlarged fragmentary section on the line 3—3, Figure 1.

Figure 4, a sectional elevation, drawn to a reduced scale, showing apparatus of the type illustrated in Figure 1, in combination with a rotary ball or tube mill,

Figure 5, an enlarged perspective view of a portion of the foraminous wall of the mill, showing the method of mounting the same with relation to the helical conveyor,

Figure 6, an enlarged and sectional fragmentary view, showing the method of securing the foraminous wall at the feed-end of the mill, and the method of securing the screen at the discharge end of the mill with which it is associated,

Figure 7, an enlarged section on the line 7—7, Figure 4,

Figure 8, a sectional elevation of a form of apparatus in which the material is separated in more than two sizes by the provision of a plurality of screens of progressively increasing mesh, to constitute the peripheral wall of the trommel,

Figure 9, a longitudinal section of a form of apparatus in which the open peripheral surface of the trommel is formed by the spaced outer edges of the helical blade, in connection with a skeleton frame in which the blade is mounted,

Figure 10, a transverse section taken on the line 10—10, Figure 9, and

Figure 11, a modification of the form shown in Figures 9 and 10, in which the spaces between the convolutions of the helical blade are divided by spaced rings fastened in the skeleton frame.

Referring first to Figures 1 to 3 inclusive, the outer wall of a trommel 5 is composed of a cylindrical perforated plate 6 mounted upon a series of equidistantly spaced longitudinally extending flat bars 7. The bars are connected at opposite ends of the trommel by spiders 8 and they further function to support the continuous helical blade 9, which in the operation of the apparatus conveys the material from one end of the trommel to the other.

The helical blade is notched, as shown at 10 in Figure 1, to admit the bars of the skeleton structure of the trommel and it will be seen that by this means, the blade is placed immediately against the inner surface of the perforated wall of the screen.

This is an important feature of the invention since it permits of dividing the material cleanly into two sizes, while it is being conveyed in a continuous movement from one end of the trommel to the other. It will further be noted that the movement of the material along the path defined by the helix is unobstructed, it being essential that by an uninterrupted movement of the material its smallest particles are constantly brought in contact with the inner surface of the perforated wall.

At one end of the trommel is an inwardly flaring flange 12 to provide a mouth into which the material is fed from a launder 13, and at the opposite end of the trommel is an outwardly flaring lip 14 over which the oversize of the sorted material is delivered into a chute or conveyor 15.

The flange and the lip are formed integrally with cylindrical members 16 and 17 that are

fitted inside the ends of the cylindrical perforated wall 6, and the said ends of the wall are clamped upon said members by means of hoops 18 having apertured heads 19 for the connection of take-up bolts 20. The bolts are threaded at their ends for the application of nuts that bear upon the heads as best shown in Figure 2. The longitudinal edges of the perforated plate adjoin each other upon one of the bars, and the plate is secured thereto by bolts 21 and nuts 22 as has been shown in Figure 3.

The heads of the bolts engage upon the bar, and the nuts on the protruding ends of the bolts are screwed home upon washers 23 on the outside of the plate.

The trommel constructed as hereinabove described is fixedly mounted upon a shaft 24 by means of its spiders 8. The shaft extends axially of the perforated wall and it is supported for rotation in boxes 25 at opposite ends of the trommel.

A pulley 26 on the shaft is for the purpose of rotating the shaft by the driving action of a motor or line-shaft.

In the operation of the rotating screen, the material fed into an end thereof, through the launder 13 is advanced along the inner surface of the perforated wall in a helical course defined by the blade 9, in a continuous and uninterrupted movement.

During the advancing movement of the material, its smallest particles are brought in contact with the wall of the trommel and pass through the perforations of the same, into a hopper 27. The oversize of the material continues its movement toward the discharge end of the trommel where it passes across the lip 14 into the chute 15.

A clean separation between the fine and coarse particles of the material is thus obtained, in a practical, efficient and economical manner.

In case of wear or breakage the perforated plate is easily removed and replaced by another. The replaceability of the plate is also of advantage in case it is desired to change the mesh of the perforated wall of the screen.

In the construction shown in Figures 4 to 7 of the drawings, the trommel is rigidly secured at the discharge end of a disintegration mill 28 of the rotary type. The mill may be a ball mill, tube mill or any other type of mill in which the disintegration of the material is effected in a rotary movement. The trommel of the screen has at its feed end, an inwardly extending flange 29 which is bolted to a flange 30 at the discharge end of the mill as clearly shown in Figure 6.

In the use of the screen, the shaft of the construction illustrated in Figure 1 is obviously omitted, the screen being in its entirety supported by the rotary mill which is mounted upon suitable bearings one of which has been shown at 31 in Figure 4. As a modification of the first described screen, the wall of the trommel is composed of a single piece of wire screening 32, the ends of which overlap one another and may be secured together by bolts 33 as shown in Figure 7.

In the operation of the mill, the disintegrated material passes from the mill into the trommel and is by means of the helical blade conveyed to the discharge end of the same in a continuous and unobstructed movement. As in the first described form of the invention, the material is cleanly divided into two separated sizes. It is a distinctive advantage that the combination of the separating apparatus with the mill, as shown and described, provides for the conveyance and simultaneous sizing of material discharged from the mill, entirely by the rotary movement of the mill and without the use of separately operating conveying and screening devices heretofore employed.

The form of the invention, illustrated in Figure 8 adapts it for separating material into more than two sizes by forming the foraminous wall of the trommel, of a plurality of end-to-end arranged screens of different mesh. The screens have been designated by the numerals 34, 35 and 36. Their mesh increases progressively from the feed-end of the trommel to the discharge end of the same and the different sizes that are separated from the oversize delivered at the discharge end, are received in hoppers 37, 38 and 39 respectively.

The screens are secured at the ends of the trommel and at their adjoining ends by bands 18 similar to those that secure the single screen in the form of the invention shown in Figure 1.

In this connection, it is to be understood that the foraminous wall of the trommel, shown in Figure 1, may be made in two or more sections of equal mesh placed end-to-end and held in place by bands in the manner illustrated in Figure 8. This is of particular advantage in case it is desired to use metal of standard sizes.

The forms of the invention, hereinbefore described, are alike in that the peripheral walls of the trommel, are composed of perforated plates or screens engaged at their inner surfaces by the helical blade which conveys the material from the feed-end of the trommel to the discharge end of the same.

In the forms shown in Figures 9 to 11, the screens or perforated plates are omitted and the helical blade itself provides the openings through which the undersize or undersizes of the material is or are discharged. Inasmuch as the peripheral openings of the trommel are in these forms of the invention, necessarily larger than those provided by a screen or perforated plate, the modifications of Figures 9 and 11 place the invention under the grizzly type of separating apparatus as well as in the class of screens typified in Figures 1 to 8.

In Figures 9 and 10, the helical blade is mounted in the skeleton frame composed of the end-members 12 and 14 and the longitudinal bars 7 of the form shown in Figure 1. Outwardly diverging spaces 40 between the convolutions of the helical blade provide the openings through which the undersize of the material is discharged, separate from the oversize which, as before, passes through the end 14 of the trommel.

In the form shown in Figure 11, the peripheral openings 40 of the trommel are reduced in size by the provision of spaced rings 41 placed between the convolutions of the helical blade, and likewise fastened to the longitudinal bars 7.

It is apparent that the forms illustrated in Figures 9 and 11 may be used for independent operation similar to that of Figure 1, or that they may be employed in connection with a rotary mill as is shown in Figure 4.

It is furthermore understood that other variations in the construction and arrangement of the parts of the separating apparatus may be resorted to without departing from the scope of the invention, as defined in the hereunto appended claims.

What I claim and desire to secure by Letters Patent is:

1. The combination with a rotary disintegrat-

ing mill having a discharge opening at an end thereof, of an open ended cylindrical screen, means fixing said screen for rotation with the mill, and with one of the ends of the screen in connection with the opening for the reception of material discharging from the mill, said means including an inturned flange at the end of the screen effective to reduce the opening at such end, and a frusto-conical deflecting member connecting said flange and the discharge opening of the mill, said screen having a helical blade disposed therein to form in conjunction with the inner surface thereof, a path for the continuous movement of discharging material away from the mill, and means extending from said inturned flange, forming a self-contained support for said screen.

2. The combination with a rotary disintegrating mill having a discharge opening at an end thereof, of an open ended cylindrical screen, means fixing said screen for rotation with the mill, and with one of the ends of the screen in connection with the opening for the reception of material discharging from the mill, said means including an inturned flange at the end of the screen effective to reduce the opening at such end, and a frusto-conical deflecting member connecting said flange and the discharge opening of the mill, said screen having means disposed therein and conjointly operative with the inner surface thereof, to form a substantially helical path for material discharged into the screen, and means extending from said inturned flange, forming a self-contained support for said screen.

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