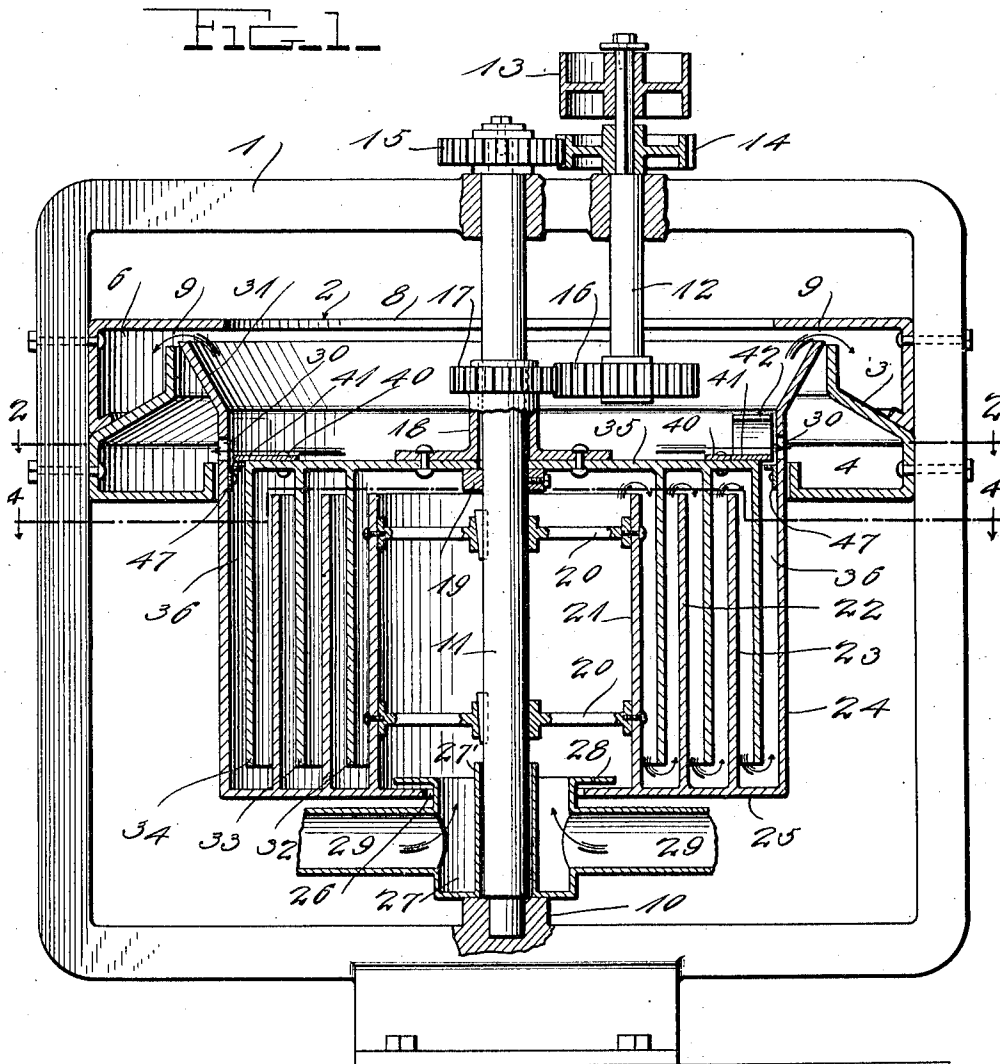


E. O. MATTERN.
CENTRIFUGAL CONCENTRATOR.
APPLICATION FILED MAY 2, 1912.

1,048,846.

Patented Dec. 31, 1912.

3 SHEETS—SHEET 1.



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3 SHEETS-SHEET 2.

FIG. 2.

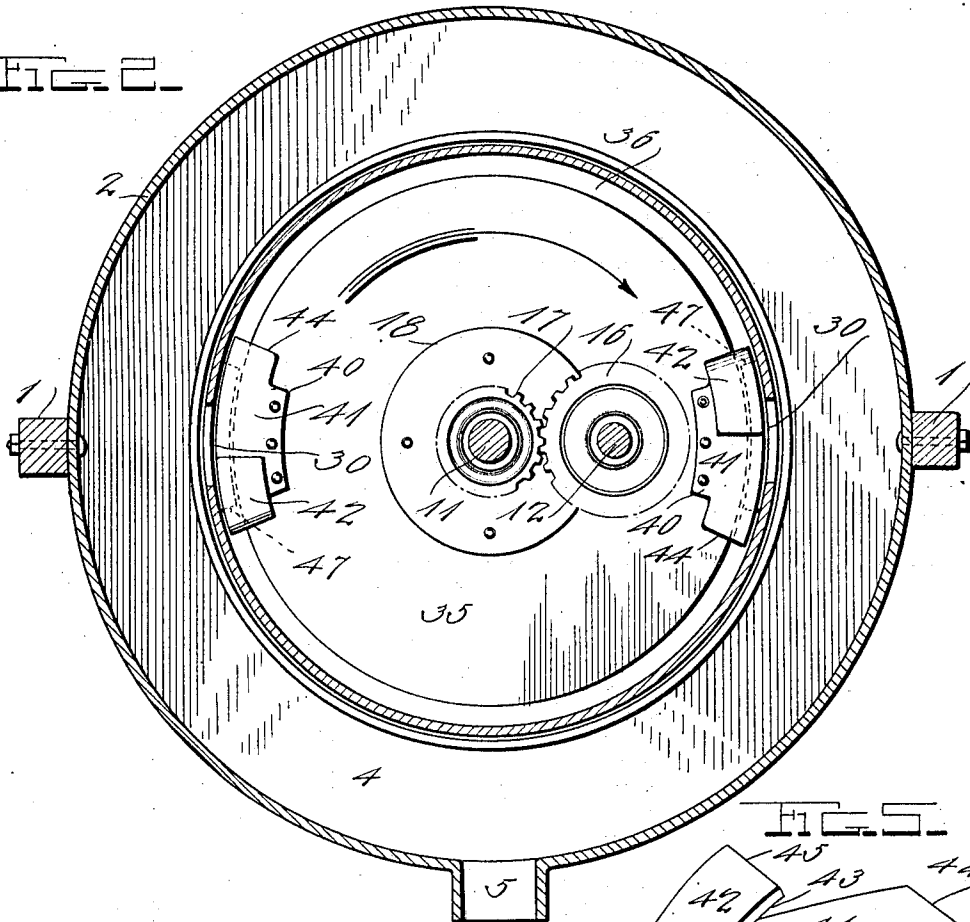


FIG. 3.

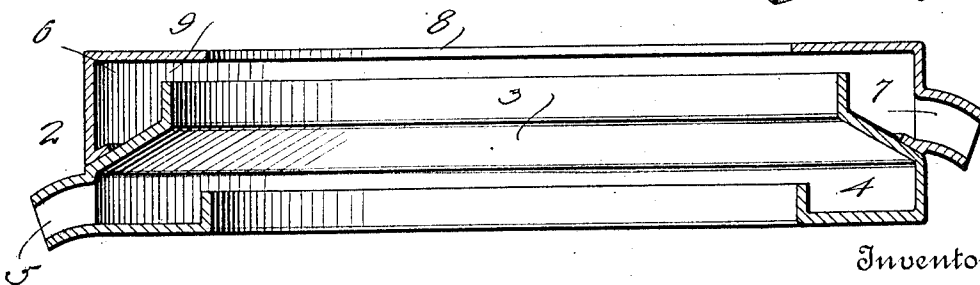
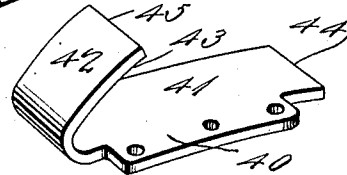


FIG. 4.



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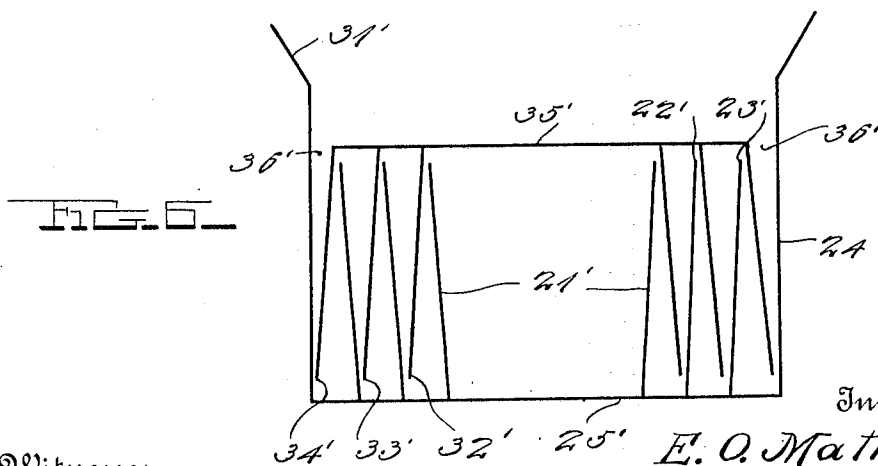
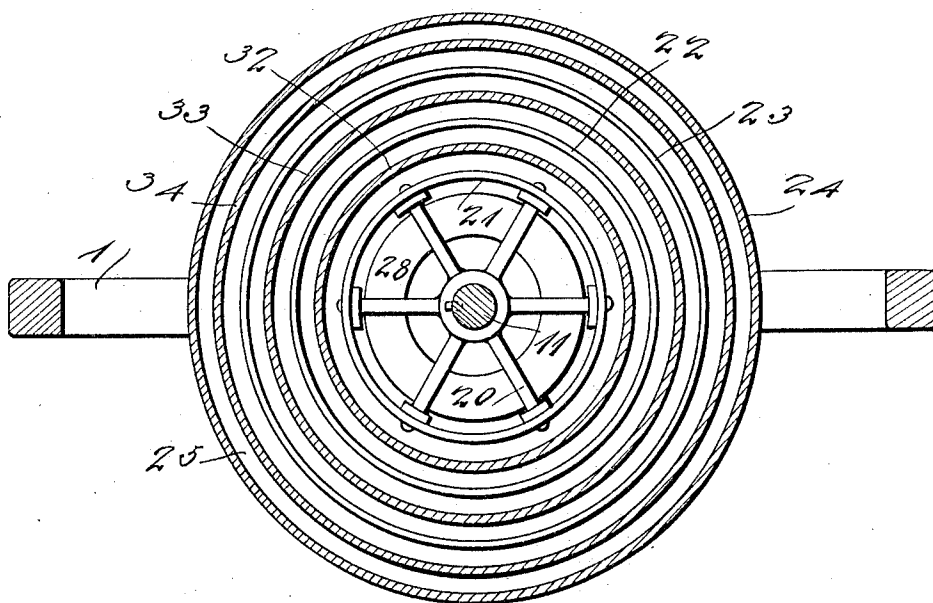
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3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE

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CENTRIFUGAL CONCENTRATOR.

1,048,846.

Specification of Letters Patent.

Patented Dec. 31, 1912.

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To all whom it may concern:

Be it known that I, ERNEST OTTO MATTERN, a citizen of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Centrifugal Concentrators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to separators, and more especially to those wherein the concentrates are separated from the tailings by centrifugal action; and the object of the same is to improve the construction of a machine of this character, adapt it for action on ores of various grades, and increase the output. These objects are accomplished by constructing the machine as hereinafter more fully described and claimed, and as shown in the drawings wherein—

Figure 1 is a central vertical transverse sectional view through the machine complete. Fig. 2 is a plan view thereof with the frame in section. Fig. 3 is a cross section through the launder. Fig. 4 is a horizontal section on the line 4—4 of Fig. 1. Fig. 5 is an enlarged perspective detail of the scraper. Fig. 6 is a diagrammatic vertical transverse sectional view illustrating a modified form of this device which will be explained hereinafter.

In the preferred embodiment of my invention shown in the drawings attached, a frame 1 supports a fixed launder 2 containing a partition 3 dividing it into two annular channels whereof the lowermost numbered 4 is for the values or concentrates and has its outlet 5, and the uppermost numbered 6 is for the tailings and has its outlet 7. A rather wide flange 8 projects inward from the outer wall of the launder 2 and stands a little distance above the upper edge of the partition 3, between which edge and flange is left an annular inlet 9 into the channel 6, this inlet being at the highest point within the launder so that the lightest particles in the tailings will pass into it by reason of the presence of the overhanging flange 8.

Mounted in any suitable bearing, such as the step 10 within the frame 1, is an upright shaft 11 which may be rotated in any suitable manner. In the drawings I have shown a power shaft 12 parallel with the

main shaft 11 and having a power wheel 13 which may be connected by belt with a suitable source of energy, and this shaft is geared as at 14 and 15 to the upper end of the main shaft, while it is also geared as at 16 and 17 to a hub 18 which is journaled around the main shaft above a collar 19 thereon, the various gears being so proportioned that the hub will rotate faster than the main shaft. I may here say that the difference in speeds may be varied as the nature of the ore or its richness may require, and also the speed at which the power shaft is driven may be varied as required by the size and construction of the machine, the speed with which the slime is fed to it, and climatic and other conditions.

It will not be necessary for the purposes of this specification to describe in detail the various bearings for the shafts nor the means for permitting the substitution of different pairs of gears when the relative speed of the two shafts is to be changed, but in any event the hub 18 should rotate a little faster than the main shaft 11.

Secured to the main shaft by any suitable means such as the spiders 20 is an inner cylinder 21, surrounded by concentric cylinders 22, 23 and 24, and all these cylinders are mounted at their lower edges upon the lower head 25 which is a disk having a central opening 26. Through the latter projects an upright pipe 27 having a flange 28 at its upper end overlying the head 25 around the opening 26, and within this pipe around the shaft is a sleeve 27' between which and the pipe is formed an annular inlet; and the slime to be treated is fed into said inlet through the feed pipe 29 in any suitable manner not necessary to illustrate.

The outermost cylinder 24 rises somewhat higher than the others and past the upper edge of the inner wall of the launder 2, above which edge the cylinder is pierced with two (and in larger machines four, or possibly three) rectangular outlet openings 30 through which the values or concentrates are delivered into the channel 4. The upper end of said outermost cylinder is preferably flared at 31, the upper edge of the flaring portion leading directly to the inlet 9 into the channel 6, and it is intended that the tailings shall flow over the flaring edge 31 and into this channel.

Secured to and carried by the hub 18 is the upper head 35 which is a disk surround-

ing the main shaft but free from it, and depending from this head is an inner pendant cylinder 32 disposed between the two innermost upright cylinders 21 and 22, and surrounded by concentric pendant cylinders 33 and 34 situated respectively between the other upright cylinders as shown. I have described and illustrated four of the latter and three of the former although there could be more or less, but in any event the upper edges of the upright cylinders do not touch the upper head 35 and the lower edges of the pendant cylinders do not touch the lower head 25, so that a tortuous passage is formed from the interior of the innermost upright cylinder 21, up and down, to the interior of the outermost upright cylinder 24. Here this passage communicates, through the annular space 36 between the edge of the upper head 35 and the outermost cylinder 24, with the chamber above said head; and, while the staggered arrangement of the various cylinders produces a tortuous passage in the lower part of the machine, the material within said chamber is subjected to the uninterrupted influence of centrifugal action.

Secured upon the upper head 35 is the foot 40 of a scraper whose body is curved on its outer edge so that it will slide along the inner face of the projected upper portion of the outermost cylinder 24, and which body when viewed from the axis is angular as seen in Fig. 5 so that it includes a flat base 41 of a width radially of the machine sufficient to cover the space 36, and a wing 42 rising obliquely from the rear end of the base to a point coincident with the line where the cylinder 24 begins to flare as at 31. This scraper is of some considerable length circumferentially of the machine and travels (with the upper head 35) with its open mouth 43 forward, the front edge 44 of the base cutting under the heavier accumulations around the edge of said chamber and the front edge 45 of the wing cutting through the accumulations which are a little lighter (though not sufficiently light to pass over the flaring portion 31) and drawing them downward within the scraper as it moves and delivering them radially outward through the openings 30 as the scraper passes them. For preventing the material moving upward through the space 36 from passing directly out the several openings 30, I secure to the inside of the outermost cylinder 24 and beneath each opening a baffle plate 47 which in effect affords an interruption in the space 36 at each of these points, and over which the scraper moves as it is carried around by the upper head 35.

It will not be necessary to state the proportions or materials of parts nor to further amplify details which are susceptible of considerable change so long as the spirit of the invention is retained. In Fig. 6 I have

shown how all of the cylinders may flare slightly from their heads outward, and designated them by the same reference numerals with prime marks added, but I would prefer that the outermost cylinder 24 should be truly cylindrical throughout its entire height. It might be possible, although it is hardly necessary to illustrate, to make all of the cylinders except the outermost more or less conical or flaring in the opposite direction from that shown; but these and other changes may be left to the manufacturer and perhaps dictated as a result of the experience of the user.

The solution of ground ore and water in proper proportions (slime) is fed through the feed pipe 29 and passes up the pipe 27 into the innermost cylinder 21 wherein it is driven radially outward by centrifugal force; rising therein it passes over the upper edge of the cylinder, under the head 35, and downward within the inner pendant cylinder 32; passing under the lower edge of this cylinder, over the lower head 25, it rises within the next upright cylinder 22; and this tortuous course is followed to the interior of the outermost cylinder 24, the heavier particles or concentrates becoming more and more thoroughly separated from the lighter particles during the progress of the material through the tortuous course referred to until, when the mass reaches and passes through the space 36, the heavier particles lie next against the outermost cylinder 24 and the lighter particles (waste) and water are inside of the concentrates or values, and the entire mass tends to accumulate around the edge of the chamber above the head 35. Through this accumulation the rotating scraper is constantly moving, its mouth 43 gathering the values and its body carrying them along to the openings 30 which, one after another, deliver them into the channel 4; and meanwhile the passage of the scraper through said mass pushes forward of it the lighter particles or tailings which are raised off the head 35 onto the flaring portion 31 of the cylinder 24, from which centrifugal action carries them through the space 9 under the flange 8 into the channel 6.

As stated before, the character and richness of the ore and several other conditions will determine the speed of rotation of the power shaft and the relative speed of rotation of the main shaft, and also the relative sizes of the various parts of this machine; but I have found by experiment that by using the slimes from the Ohio copper mines, I can make a product of about 12% which will assay from 2% to 12%. A feature of this invention lies in the fact that it arrests and separates the smallest particles of mineral floats which under ordinary conditions of concentration are lost, and

another advantage possessed by the machine is its enormous capacity and output, as it can be run continuously as long as one grade of ore can be supplied. In the claims appended, I desire by the word "cylinder" to include the elements of that name whether they are truly cylindrical or not.

What is claimed as new is:

1. In a centrifugal concentrator, the combination with a lower head and a series of upright cylinders mounted thereon, the outermost rising above the others and pierced with discharge openings near its upper end; of an upper head whose edge stands in plane below said openings, a second series of cylinders depending from this head between those in the first series, a scraper mounted on this head in position to move across said openings, and means for rotating the heads.

2. In a centrifugal concentrator, the combination with parallel disk-shaped heads disposed one above the other and the lowermost having a slime inlet, and means for rotating them simultaneously in the same direction; of a series of upright concentric cylinders rising from the lower head toward the upper, the outermost rising past the edge of the upper head and pierced with discharge openings above it and flared above said openings, and a second series of concentric cylinders depending from the upper head between those in the first series and with their lower edges spaced above the lower head.

3. In a centrifugal concentrator, the combination with a lower head having a slime inlet, a series of upright concentric cylinders mounted thereon, the outermost rising above the others and pierced with discharge openings near its upper end, and a channel surrounding this cylinder and into which said openings deliver; of an upper head whose edge is spaced from the upper portion of said outer cylinder and stands in a plane below its openings, a second series of concentric cylinders depending from this head between those in the first series, a scraper mounted on this head in position to move across said openings, and means for rotating the heads in the same direction but at different speeds.

4. In a centrifugal concentrator, the combination with a lower head having a slime inlet, and a cylinder rising from this head and pierced with discharge openings above which it is flared, of an upper head whose edge is spaced from said cylinder and stands below its openings, a cylinder depending from this head within and concentric with the other cylinder, a scraper carried by this

head in position to move across said openings, and means for rotating the heads in the same direction and the uppermost head faster than the other.

5. In a centrifugal concentrator, the combination with a lower head having a slime inlet, and a cylinder rising from this head and pierced with discharge openings near its upper end, of an upper disk-shaped head disposed within said cylinder below its openings and smaller than the cylinder so as to leave an annular space between them, baffles carried by said cylinder in such space beneath the openings, a cylinder depending from this head within and concentric with the other cylinder, a scraper carried by this head in position to move across the openings and above the baffles, and means for rotating both heads, the uppermost faster than the other.

6. In a centrifugal separator, the combination with an upright cylinder having discharge openings; of a disk-shaped head rotating within and smaller than the cylinder so as to leave an annular space between them, a cylinder depending from this head within the other cylinder, and an angular scraper having a flat base connected with said head and projecting over said annular space and a wing rising obliquely from the rear end of the base, the scraper being so disposed that its outer edge travels against the inner face of the outer cylinder and the front edges of its wing and base pass respectively across the upper and lower edges of said openings, for the purpose set forth.

7. The herein described centrifugal separator comprising an upright shaft having a collar, a hub mounted thereon above the collar, means for rotating the shaft and hub, the latter more rapidly than the former, a lower head carried by the shaft and having a series of upright concentric cylinders, the outermost of which rises above the others and is pierced with discharge openings, an upper head carried by the hub and having a series of concentric cylinders depending into the spaces between the other cylinders, the edge of this head being spaced from said outermost cylinder and standing below the openings in the latter, and means for feeding slime to the interior of the innermost cylinder.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ERNEST OTTO MATTERN.

Witnesses:

KATHERINE O'NEIL,
C. HEMIHABBÉ.