

No. 873,593.

PATENTED DEC. 10, 1907.

J. W. PHILLIPS.
CENTRIFUGAL SEPARATOR.
APPLICATION FILED MAR. 28, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

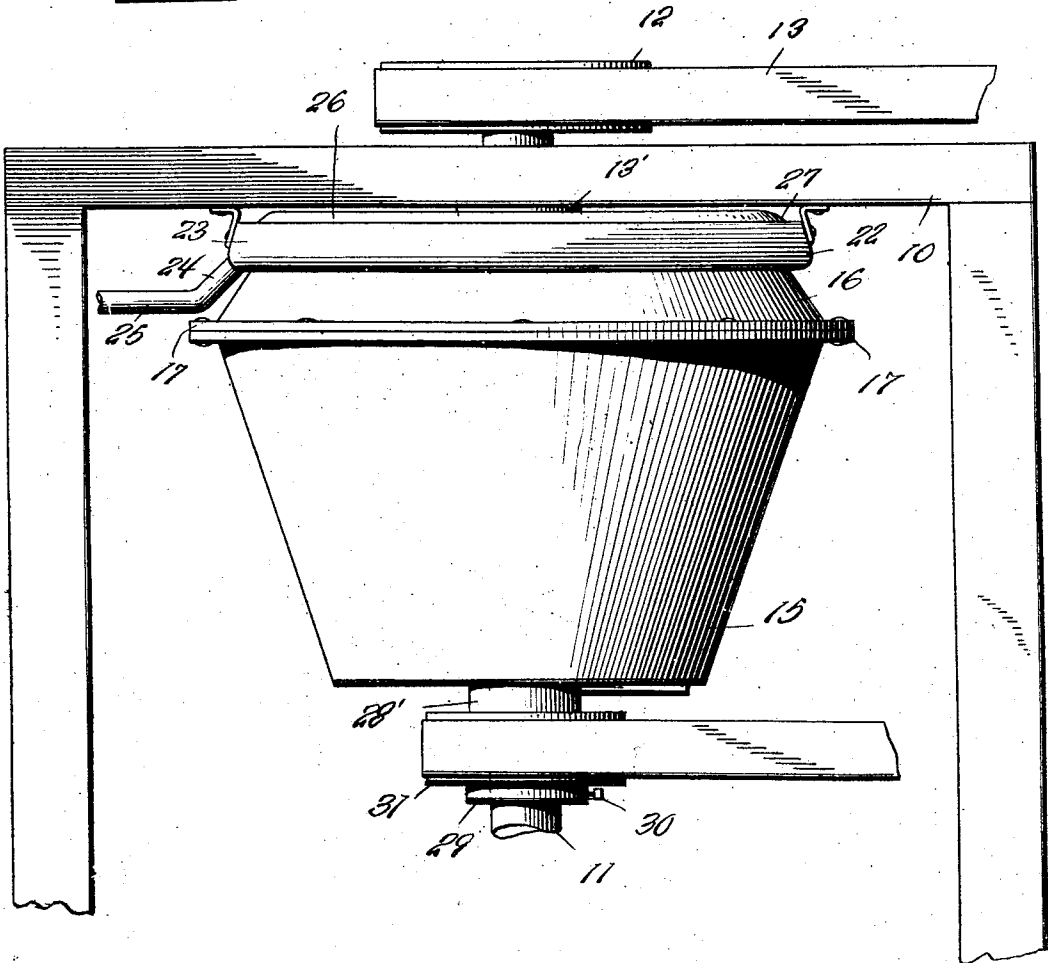
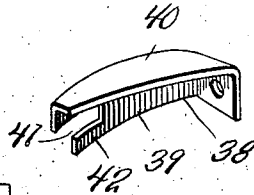


Fig. 6.



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3 SHEETS—SHEET 2.

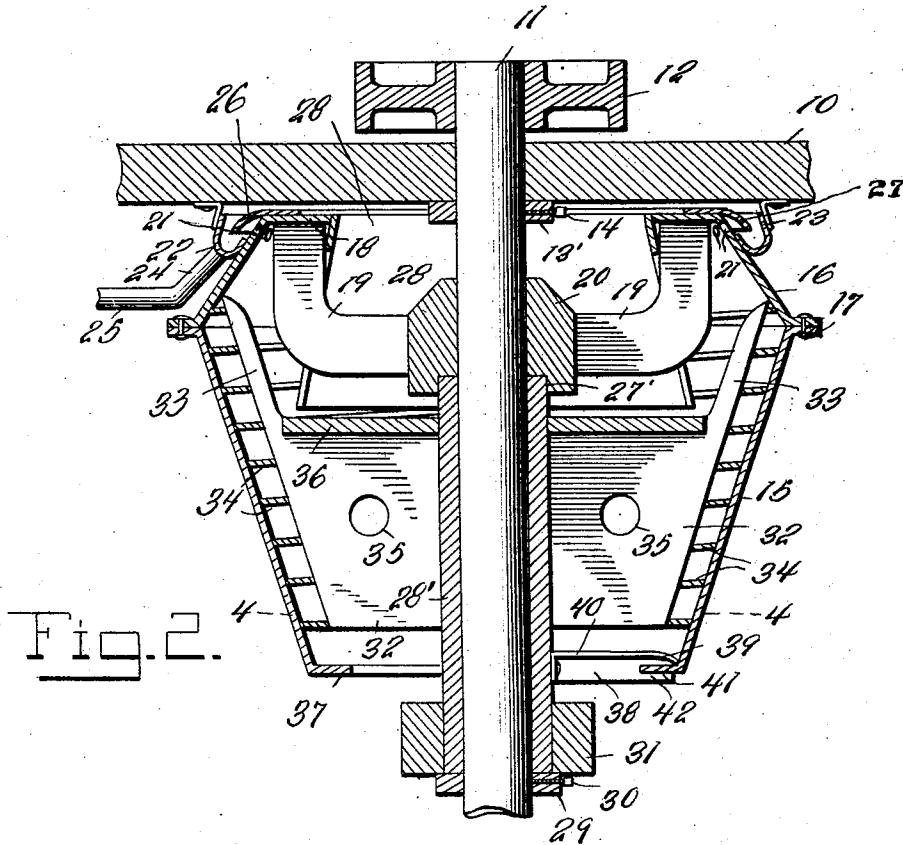


Fig. 2.

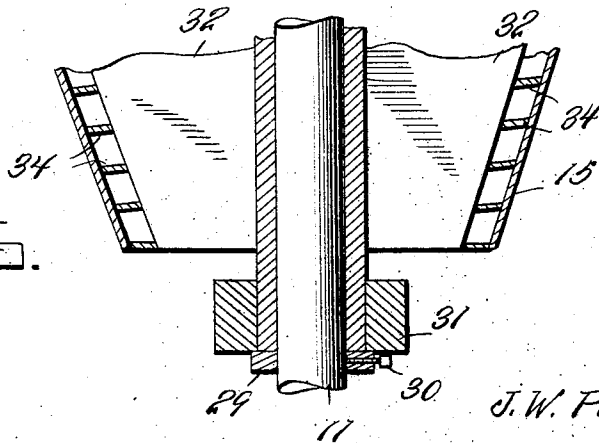


Fig. 5.

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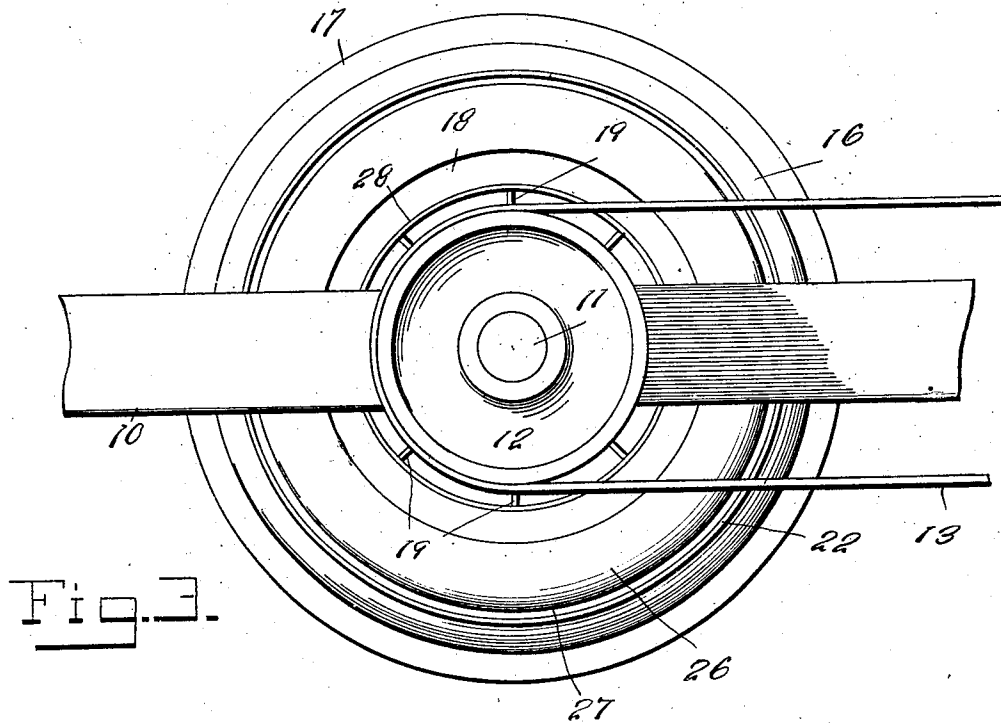
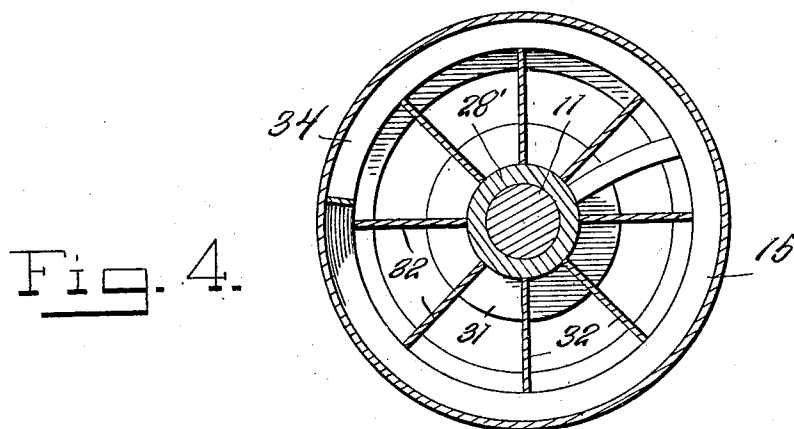
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

JOHN W. PHILLIPS, OF SILVER CITY, NEVADA.

CENTRIFUGAL SEPARATOR.

No. 873,593.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed March 28, 1906. Serial No. 308,557.

To all whom it may concern:

Be it known that I, JOHN W. PHILLIPS, a citizen of the United States, residing at Silver City, in the county of Lyon, State of Nevada, have invented certain new and useful Improvements in Centrifugal Separators; and I do hereby 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 centrifugal separators and more particularly to that class of separators which are utilized to separate ores from liquids.

The primary object of the invention is to provide a separator which will efficiently perform its function in completely separating the ore and liquid introduced therein.

The invention includes among other features novel means for removing the liquid and ores from the machine during the process of separation.

The device is of such construction that the mixture will not be directed against the walls of the separator until it has entirely entered the same, the means for so directing the liquid being a rotary disk which is located adjacent the middle of the device.

As a further novel feature, the invention includes means for removing any separated ore which may collect in the bottom of the separator.

In the accompanying drawings, Figure 1 is a view in elevation of the separator. Fig. 2 is a vertical sectional view through the same. Fig. 3 is a top plan view of the same. Fig. 4 is a horizontal sectional view on the line 4-4 of Fig. 2. Fig. 5 is a vertical sectional view through the lower end of the casing of the separator, showing a slightly modified form of the invention, and, Fig. 6 is a detail perspective view of the scraper.

Referring more specifically to the drawings, the numeral 10 denotes the upper portion of the frame in which my separator is mounted. A shaft 11 has a bearing in the frame 10 and upon the said shaft, above the frame, is secured a pulley 12 around which is engaged a belt 13 from a drive shaft (not shown) by means of which the shaft 11 is rotated. To prevent upward movement of the shaft 11 in its bearing in the frame 10, a collar 13' is secured upon the shaft by

means of a set screw 14 and bears against the under side of the frame 10.

The separator includes a casing composed of major and minor frusto-conical sections 15 and 16 respectively, each of which is provided at its base with an annular flange 17 by means of which the sections are united. The section 16 is provided at its upper end with an inwardly directed annular flange 18 to the under side of which is secured the upturned ends of arms 19 which radiate from a collar 20 secured to the shaft 11 in any suitable manner. These arms 19 support the casing as will be readily understood and cause rotation of the said casing with the shaft 11. Formed in the upper end of the minor section 16 at its junction with the flange 18 is an annular series of openings 21 which constitute an outlet for the liquid separated from the mixture introduced into the separator as will be hereinafter fully explained. Secured in any desired manner to the under side of the frame 10, is an annular trough 22 which has its inner side lying close to the side of the minor section 16 below the openings 21 and its outer side 23 extending with its upper edge above the plane occupied by the series of openings. Leading from the annular trough 22 is a spout 24 with which is connected a pipe 25 through which the waste liquid is discharged. In order that the waste liquid as it is discharged through the openings 21 may be directed into the trough 22, I provide an annular deflector plate 26 which is secured at its inner edge to the flange 18 and which has its outer edge directed downwardly, as at 27, into the trough 22 and in the direction of the outer side 23 of the same.

It will, of course, be understood that the raw material to be separated is introduced into the separator from the top and in order to prevent the same from reaching the sides of the casing adjacent its upper end, an annular shield 28 is provided, the said shield being secured at its upper end to the inner edge of the annular flange 18 and depends therefrom, and has its wall tapered upwardly for a purpose to be hereinafter set forth.

The under face of the collar 20 is recessed annularly as at 27', to receive the upper end of a sleeve-shaft 28', which is disposed upon the shaft 11 and has its lower end resting

upon a collar 29 which is secured by means of a set screw 30 to the said shaft 11. Secured upon the sleeve-shaft 28' adjacent its lower end is a pulley 31 by means of which the sleeve shaft may be rotated independently of the shaft 11.

Extending radially from the sleeve-shaft 28' are wings 32 which are provided at their upper and outer edges with upwardly directed extensions 33 to the outer edges of which and the said wings proper are secured spirally disposed blades 34 which contact with the inner face of the major section. The extended portions 33 terminate in a plane above the junction of the two sections and the upper ends of the blades 34 are tapered to conform to the taper of the wall of the minor section 16 to prevent lodging of ore in angle formed by the connection of the two sections. Each of the wings 32 is provided with an opening 35 to allow free circulation of the liquid during the process of separation. Secured to the shaft 28' and the upper edges of the wings 32 in a plane below that occupied by the lower edge of the shield, is a circular plate 36 upon which the raw material is thrown, by means of the said annular shield 28. From this plate the material is thrown by centrifugal force upon the sides of the casing and is acted upon by the spirally arranged blades 34, which force the waste liquid upwardly and through the openings 21 and allow the heavy particles of ore to descend. The taper of the minor section 16 is such that should any particles of ore be carried by the liquid against the inner face of this section, the said particles will by reason of their gravity and the centrifugal force exerted, drain back to be acted upon by the blades 34. In the preferred form of my invention, the wings 32 and blades 34 terminate short of the lower end of the major section 15 and this said end is provided with an inwardly directed annular flange 37 upon which the particles of ore are designed to lodge. Secured to the sleeve 28' is a scraper 38 which is formed of sheet metal and has its blade portion bent longitudinally at right angles to form a portion 39 which lies vertically with respect to the flange 37 and a portion 40 which lies parallel to the said flange. The portion 39 is notched as at 41, to receive the flange 37 with the lug 42, formed by notching the said plate, lying against the under side of the flange 37 to prevent vertical movement of the scraper. The portion of the blade located above the notch is adapted to scrape the surface of the flange 37 and the portion 38 of the scraper prevents the ore from running over the said blade portion 39. The scraper has its outer end curved in a direction opposite to the direction of rotation of the casing of the separator in order to direct the accumulated ore from the flange 37 into a suitable receptacle (not shown).

In the form shown in Fig. 5, the spiral blades extend to the extreme lower end of the major section 15 and deposit the separated ore directly into a suitable receptacle, the flange 37 in this case being omitted.

In practice, the pulleys 12 and 31 are of such size that shaft 11 and sleeve shaft 28' will be rotated at different speeds, the shaft 28' more rapidly than the shaft 11.

What is claimed is:

1. A centrifugal separator comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections secured base to base, a sleeve shaft mounted for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the cut away portions of the blades, the blades including upwardly directed extensions which have their ends terminated above the plane of connection of the frusto conical sections of the casing, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve shaft for rotation therewith and adapted to scrape material from the flange, an annular trough supported in position to surround the upper end of the upper frusto conical section of the casing, the said section of the casing being provided adjacent its upper end with openings through which material may be discharged, and a pipe leading from the trough.

2. A centrifugal separator comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections secured base to base, a sleeve shaft mounted for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the cut away portions of the blades, the blades including upwardly directed extensions which have their ends terminated above the plane of connection of the frusto conical sections of the casing, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve shaft for rotation therewith and adapted to scrape material from the flange, an annular trough supported in position to surround the upper end of the upper frusto conical section of the casing, the said section of the casing being provided adjacent its upper end with openings through which material may be discharged, a pipe leading from the trough, and means supported upon the top of the upper frusto conical section of the casing for directing such material into the trough.

3. A centrifugal separator comprising a ro-

5 a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections secured base to base, a sleeve shaft mounted
 10 for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the cut away portions of the blades, the blades including upwardly directed extensions
 15 which have their ends terminated above the plane of connection of the frusto conical sections of the casing, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve shaft for rotation therewith and adapted to scrape material from the flange, an annular trough supported in position to surround the
 20 upper end of the upper frusto conical section of the casing, the said section of the casing being provided adjacent its upper end with openings through which material may be discharged, a pipe leading from the trough, and an annular deflector flange supported upon the upper end of the upper frusto conical section of the casing for directing such material into the trough.

4. A device of the class described comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, a sleeve shaft mounted for rotation upon said first named shaft, a plate carried by the sleeve shaft, apertured wings radiating from said sleeved shaft, and blades connected with said wings.

5. A centrifugal separator comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections secured base to base, a sleeve shaft mounted for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the cut away portions of the blades, the blades including upwardly directed extensions which have their ends terminated above the plane of connection of the frusto conical sections of the casing, spirally directed blades arranged upon the inner wall of the casing and contacting at their edges with the outer edges of the blades and their upwardly directed extensions, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve shaft for rotation therewith and adapted to scrape material from the flange, and means surrounding the upper frusto conical section of the casing at the upper end thereof for collecting material discharged therefrom.

6. A centrifugal separator comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections se-

cured base to base, a sleeve shaft mounted for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the cut away portions of the blades, the blades including upwardly directed extensions which have their ends terminated above the plane of connection of the frusto conical sections of the casing, spirally extended blades arranged upon the inner wall of the lower frusto conical section of the casing, said blades having their upper end portions extended above the base of the said section and gradually tapered, whereby they extend along the inner wall of the upper frusto conical section of the casing, the inner edges of the blades being in contact with the outer edges of the radial blades upon the sleeve shaft and the upwardly directed extensions thereof, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve shaft for rotation therewith and adapted to scrape material from the flange, and means surrounding the upper frusto conical section of the casing at the upper end thereof for collecting material discharged therefrom.

7. A centrifugal separator comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections secured base to base, a sleeve shaft mounted for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the cut away portions of the blades, means for directing material discharged into the casing upon the plate whereby such material will be prevented from contacting with the inner walls of the casing before reaching said plate, the blades including upwardly directed extensions which have their ends terminated above the plane of connection of the frusto conical sections of the casing, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve shaft for rotation therewith and adapted to scrape material from the flange, and means surrounding the upper frusto conical section of the casing at the upper end thereof for collecting material discharged therefrom.

8. A centrifugal separator comprising a rotatable shaft, a casing carried by the shaft for rotation therewith, said casing being composed of a pair of frusto conical sections secured base to base, a sleeve shaft mounted for rotation upon the first named shaft, blades radiating from the sleeve shaft and having their upper edges cut away, a plate carried by the sleeve shaft and seated in the

cut away portions of the blades, a hood supported from the upper end of the upper frusto conical section of the casing and having its lower end concentrically located above the plate and adjacent thereto, the blades including upwardly directed extensions which have their ends terminated above the plane of connection of the frusto conical sections of the casing, the lower frusto conical section of the casing having an inwardly directed flange formed integral therewith at its lower end, a scraper secured to the sleeve

shaft for rotation therewith and adapted to scrape material from the flange, and means surrounding the upper frusto conical section of the casing at the upper end thereof for collecting material discharged therefrom. 15

In testimony whereof, I affix my signature, in presence of two witnesses.

JOHN W. PHILLIPS.

Witnesses:

M. DEVNEY,

E. B. HARRIS.