

No. 876,642.

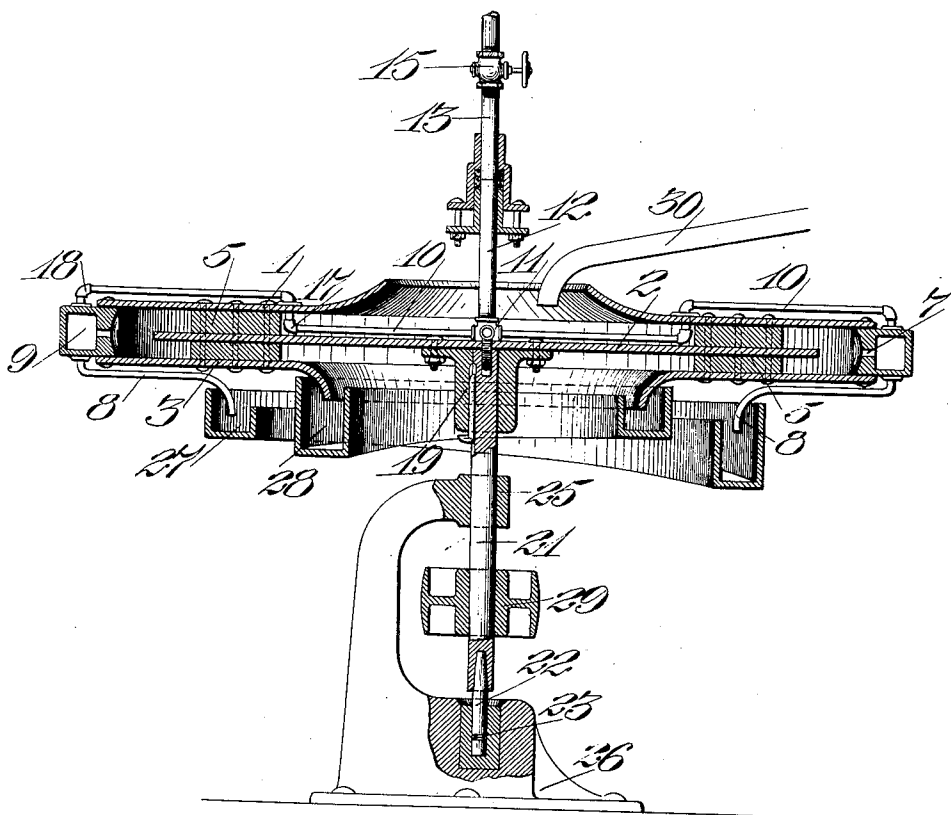
PATENTED JAN. 14, 1908.

E. HEARING & F. A. DUDLEY.  
CENTRIFUGAL CONCENTRATOR.

APPLICATION FILED JUNE 5, 1907.

2 SHEETS—SHEET 1.

*Fig. 1.*



WITNESSES

*J. Eastberg.*  
*J. H. Moore*

INVENTORS

*Edward Hearing.*  
*Fred A. Dudley.*  
BY *E. H. Strong.*  
ATTORNEY

No. 876,642.

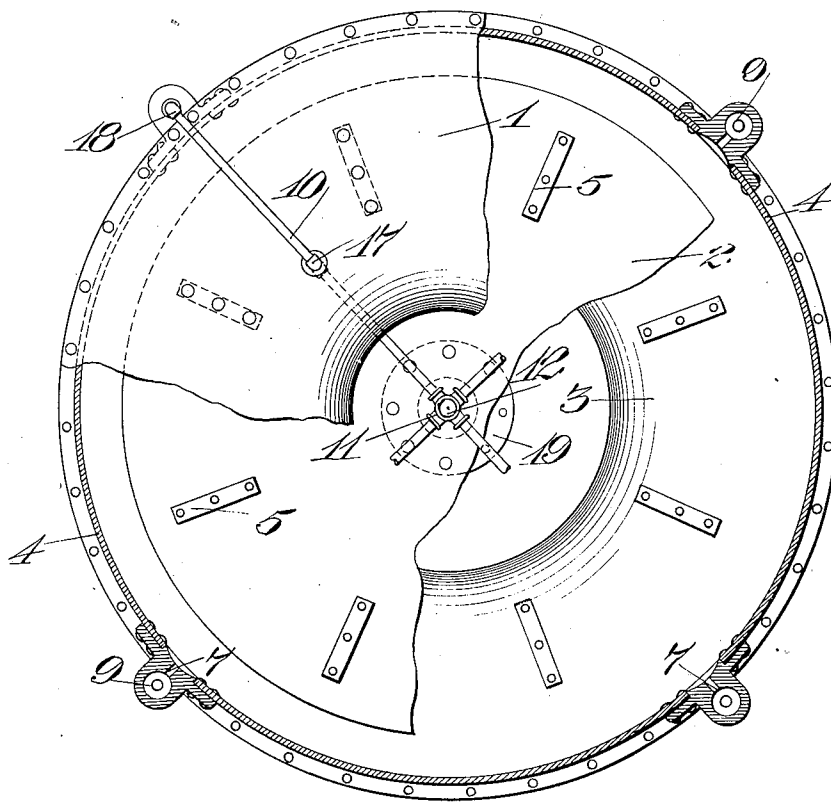
PATENTED JAN. 14, 1908.

E. HEARING & F. A. DUDLEY.  
CENTRIFUGAL CONCENTRATOR.

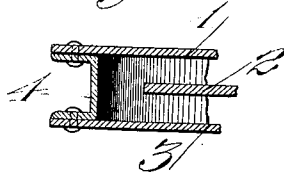
APPLICATION FILED JUNE 5, 1907.

2 SHEETS—SHEET 2.

*Fig. 2.*



*Fig. 3.*



WITNESSES

*J. H. Haring*  
*J. A. Dudley*

INVENTORS  
*Edward Haring*  
*Fred A. Dudley*  
BY *Geo. H. Strong*  
ATTORNEY

# UNITED STATES PATENT OFFICE.

EDWARD HEARING AND FRED A. DUDLEY, OF KELLOGG, IDAHO.

## CENTRIFUGAL CONCENTRATOR.

No. 876,642.

Specification of Letters Patent.

Patented Jan. 14, 1908.

Application filed June 5, 1907. Serial No. 377,352.

*To all whom it may concern:*

Be it known that we, EDWARD HEARING and FRED A. DUDLEY, citizens of the United States, residing at Kellogg, in the county of Shoshone and State of Idaho, have invented new and useful Improvements in Centrifugal Concentrators, of which the following is a specification.

Our invention relates to an apparatus for concentrating ores and like material, and it consists in the combination of parts, and in details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical section showing the construction of our centrifugal concentrator. Fig. 2 is a plan view partly broken away. Fig. 3 is a section of the rim.

This invention is a centrifugally acting concentrator which is designed to be used in the separation of fine ore from pulp and slimes which accompany it, and which are so hard to separate on any other type of apparatus now in use.

The machine is designed to run at a high rate of speed, and acts by the retardation of a portion of the material which is passing over the disks which will cause the ore to be carried back and delivered to what we term "hydraulic separators" on the outer periphery of the machine; and from which separators the separated material is discharged into collecting launders or receivers.

1, 2 and 3 are disks which may be of any suitable diameter and proportions, and which are separated from each other by metal blocks 5. These blocks may be set radially or tangentially to a central circle of small diameter, and serve to hold the disks the desired distance apart.

For a proportionate apparatus, the upper disk may be 6 feet in outside diameter, and have an 18 inch central opening; this inner edge being curved upwardly as shown.

The central disk may be flat, to be 5 feet more or less in diameter, and secured to a vertical drive shaft or arbor 21 by means of a cast iron hub or center 19 carried by the driving shaft or arbor.

The lower disk may have an outside diameter of 6 feet, and the central opening of approximately 2 feet 5 inches; the periphery of the central opening being curved downwardly to form a lip which may fit and discharge into the tailing launder or receiver, which is shown at 28.

The vertical shaft or arbor 21 is here shown having a stem or spindle 22 which rests and is turnable upon anti-frictional support or step made in any usual or suitable manner as illustrated at 23.

26 is a base or standard suitably secured in place and having an upwardly extending arm carrying a journal-box 25 for the upper portion of the arbor.

29 is a pulley between the upper and lower bearings, and which pulley illustrates a means for transmitting motion to the vertical arbor or shaft, and the parts connected therewith.

The outer rim 4 of the machine incloses the periphery of the disks 1 and 3, said rim being preferably made in sections. In the present case we have shown this rim made in four sections, leaving spaces of about 4 inches at their contiguous ends; and these spaces are filled by the hydraulic separators to be hereafter described.

The rim may be made from 4 inch, or other dimensioned channel iron or steel, and bolted to the upper and lower disks which are thus held that distance apart.

The hydraulic separators consist of an exterior cast case; each case fitting into the space prepared for it between the end of the rim sections, and the case is bolted to the rim and also to the outside disks 1 and 3. The inner faces of these separators are depressed or saucer-shaped spaces which connect with openings 7 leading from the separator to the interior of the machine, and through these openings the ore must pass.

From the separator chambers, pipes 8 of small size curve downwardly and inwardly, and discharge into a launder or trough 27 through which all the separated ore must pass.

9 represents the interior chamber of the separators which is filled with water under hydraulic pressure, and through this chamber all the ore must pass.

10 are radially disposed hydraulic pipes which furnish water to the separator and which revolve with the machine.

11 is a hollow cross having a screw upon one side to connect it with the vertical shaft, and an opening upon the upper side to receive a vertical and revoluble hydraulic pipe. The radial pipes 10 extend outwardly from this cross as previously stated. The main upright supply pipe 12 is thus revoluble with the machine.

13 is a stationary pipe through which water is brought to the apparatus and delivered to the pipe 12.

The pipes are connected by a stuffing-box or other suitable joint which allows the lower pipe 12 to turn with relation to the supply pipe 13.

15 is a valve by which the supply of water to the apparatus is controlled.

The pipes 10 are here shown as extending radially outward from the central cross to a point intermediate between the center and periphery where they are carried upward above the upper disk 1; thence outwardly to discharge into the separators. These changes of direction are effected by means of elbows at 17 and 18; or in any usual manner.

30 is a supply pipe or launder through which the pulp is brought to the machine, and is delivered through the central opening of the upper disk 1.

The pulp falls upon the top of the center disk, and is thus thrown outward by centrifugal force to the rim of the machine. The effect of this centrifugal force is to cause the fine particles to reach the rim first; the heavier ore finding its way through the pulp to the rim of the machine.

The rate of revolution of the machine may be varied and regulated to suit conditions, but the tendency will be to travel faster than the water or pulp, the inertia of which causes it to continually fall behind the machine itself. This will keep the ore moving backwardly from the point or place where it first strikes the rim, and when it has arrived at one of the openings 7, a portion of it will pass through the opening and into the separator 6 to which it leads; the water under hydraulic pressure passing through the branch pipes 10 into the chamber of the separator 9, and inwardly through the openings 7 with just enough pressure so that the ore acted upon by the centrifugal force will pass through the opening into the chamber 9 of the separator while the lighter pulp and material will be prevented from entering. The ore thus received into the separators will fall to the bottom, and will pass out through the discharge pipes 8 which will also be filled with the water, and the ore thus discharged will pass into the discharge passage or launder 27 by which it is conveyed to any desired receptacle or point of discharge. Such portion of the ore as passes one of the separators without being caught will continue its way around the rim until it reaches the next opening where another portion will be caught. The ore thus continually moving around the interior of the rim will be passed into the separators, while the waste material, sand and the like will be thrown backwardly by the outward flow of the water through the opening 7, and passing beneath the central disk 2, will discharge over the

downwardly curved inner edge or lip of the disk 3, and into the tailing launder or receiver 28 which carries it away to the tailing dump.

It will be manifest that various changes or modifications may be made in this apparatus; but the operation in any case will be substantially similar to that herein described.

Having thus described our invention, what we claim and desire to secure by Letters Patent is—

1. A concentrating apparatus consisting of a plurality of horizontally revoluble superposed disks, independent separating chambers carried by the disks at the periphery thereof and having openings thereinto, each of said chambers consisting of a separate casting independently fitted to the apparatus, means for supplying the separable material to be delivered outwardly by centrifugal force, and caused to pass over the openings into the separators, and pipes whereby water under pressure is delivered into the separators so as to form a counter current through the receiving openings.

2. In an apparatus for concentrating ores, a horizontally revoluble circular structure, said structure being formed of sections whose adjacent ends are spaced from each other, means for supplying material near the center to be carried outwardly by centrifugal action, a series of closed independent chambers located around the periphery and fitted to the spaces between the sections of the structure, said chambers having entrance openings from the central space, and means for supplying water to the chambers to exert a counteracting pressure to the centrifugal action.

3. In a concentrating apparatus, a pair of horizontal superposed revoluble disks having a rim common to both, said rim being formed of sections whose adjacent ends are separated, independent casings fitted to the spaces between the separated ends of the rim sections and having interior chambers with openings thereto from the central space and having discharge openings in the bottoms, an intermediate disk of less diameter than the outer ones and revoluble therewith, means to supply material upon the central portion of said disk to be delivered outwardly against the perforated rim, and means to return waste material towards the center beneath the center disk.

4. In a concentrating apparatus, a pair of horizontally revoluble disks of substantially equal diameter, a third disk of less diameter disposed between the first named disks, separating blocks to which the disks are fixed, and by which the distance between them is determined, a rim fixed to the peripheries of the upper and lower disks, said rim being formed of sections whose adjacent

ends are spaced from each other, independent castings fixed to the rim and filling the spaces between the rim sections, said castings forming concentrating chambers and  
5 having depressions and inlet openings connecting with the central space, means for supplying material upon the central portion of the intermediate disk whereby it is distributed outwardly by centrifugal action, a  
10 centrally disposed water supply, a cross with radial arms leading outwardly therefrom, and connecting with the concentrating chambers, means for regulating the water pressure within said chambers whereby  
15 lighter material is prevented from entering

and is caused to return beneath the central disk, discharge pipes connecting with the bottom of the concentrating chambers, and launders into which the ore from said pipe and the tailings from the bottom disk, are 20 respectively delivered.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

EDWARD HEARING.  
FRED A. DUDLEY.

Witnesses:

JOSIAH JONES,  
E. H. BAKER.