No. 758,565. PATENTED APR. 26, 1904.

J. SHIER.

ORE CONCENTRATOR.

NO MODEL. APPLICATION FILED AUG. 15, 1903. 2 SHEETS—SHEET 1.

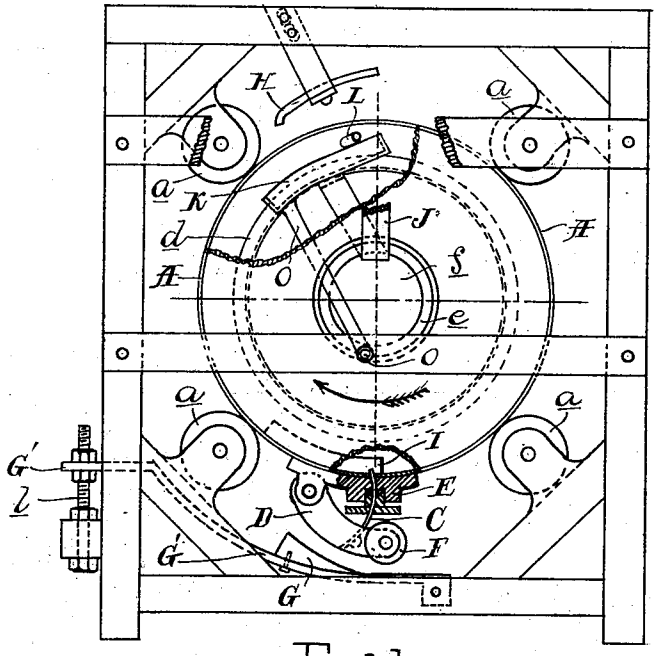

Fig. 1.

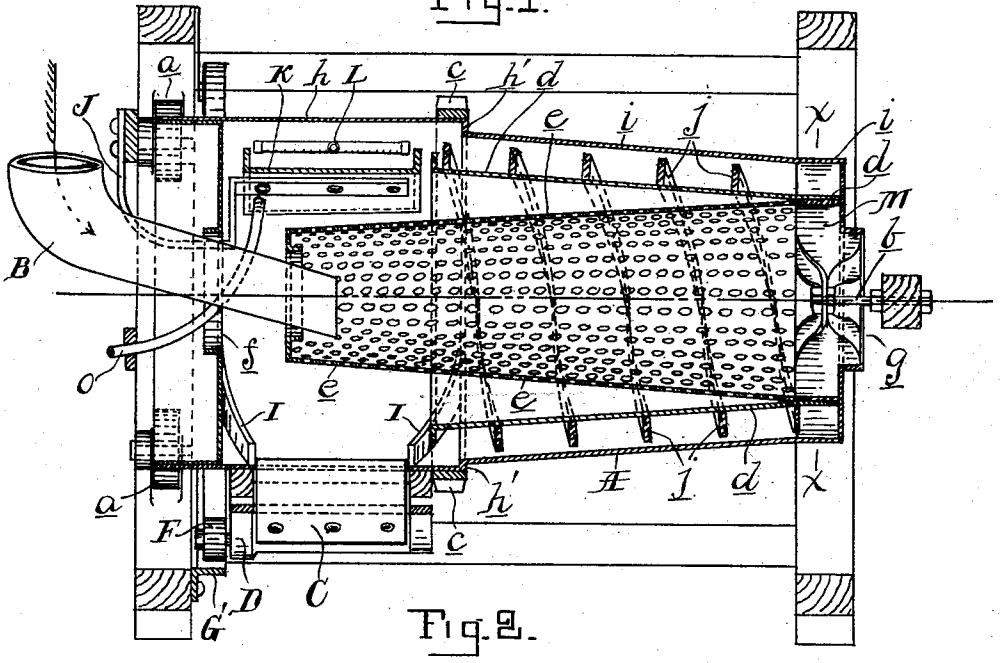

Fig. 2.

WITNESSES.

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NO MODEL. 2 SHEETS—SHEET 2.

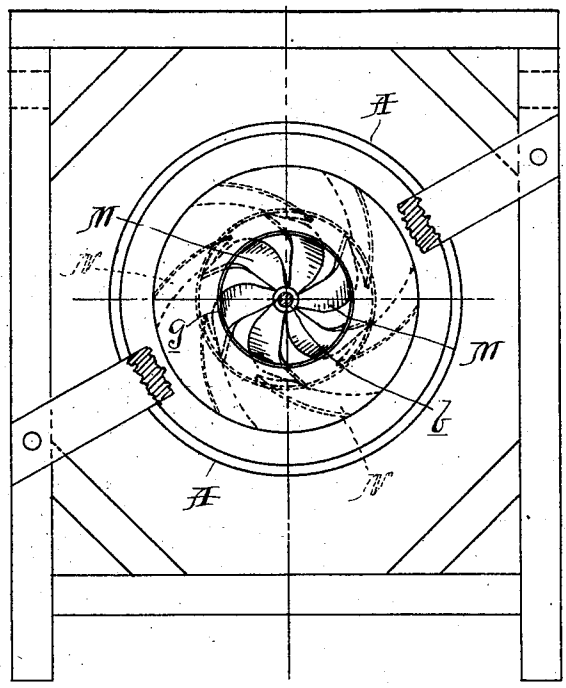

Fig. 3.

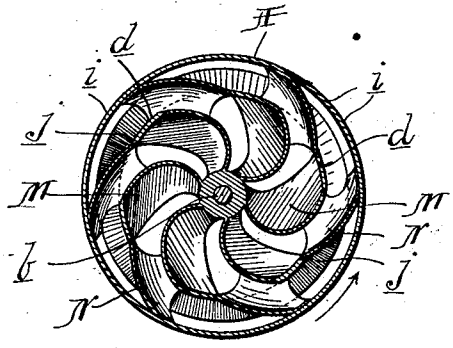

Fig. 4.

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No. 758,565. Patented April 26, 1904.

UNITED STATES PATENT OFFICE.

JOHN SHIER, OF DETROIT, MICHIGAN.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 758,565, dated April 26, 1904.

Application filed August 15, 1903. Serial No. 169,571. (No model.)

To all whom it may concern:

Be it known that I, JOHN SHIER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of ore-concentrators in which the material is subjected to the action of gravity within a revolving drum; and the invention consists in the peculiar construction, arrangement, and operation of the drum and in the novel means for collecting and removing the concentrate therefrom, all as more fully hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a front elevation partly in section. Fig. 2 is a longitudinal section. Fig. 3 is a rear elevation. Fig. 4 is a cross-section on line x x, Fig. 2.

A represents a rotary drum suitably supported in a frame free to revolve. As shown in the drawings, it is supported at its ends upon antifriction-wheels a and a trunnion b, respectively, and peripheral gear-teeth c form the means for applying suitable power for revolving the drum.

The drum consists of an outer shell and two inner shells d e, one within the other, and it is provided with inlet and outlet openings f g in its opposite ends, respectively, the former being of smaller diameter than the latter and forming a passage for the intake-spout B, through which the material is fed into the drum. The outer shell is composed of a cylindrical portion h adjacent to the inlet-opening and a tapering portion i, the cross-sectional area of which decreases toward the rear end of the drum, a small annual shoulder h' being preferably formed at the junction of the two portions. The inner shells d and e are also tapering, the former correspondingly with the tapering portion of the outer shell and the innermost shell e inversely thereto, both shells uniting at their rear ends and are secured to the head of the drum, while their front ends project freely into the cylindrical portion of the drum.

The shell d is imperforate and provided around its periphery with a conveyer-screw j, and the shell e is perforate or formed of screen its entire length and at its front end receives the discharge-spout of the feed-hopper.

The cylindrical portion of the drum has a longitudinal slit (one or more) through which passes a curved plate forming a cut-off C. This cut-off passes through a stuffing-box E and is carried by an arm D, pivotally secured to the drum and carrying at its free end an antifriction-roller F, adapted to actuate the arm and cut-off by striking in the revolution of the drum the stationary incline G below the drum, which pushes the cut-off inwardly, and a stationary incline H above the drum, which causes the withdrawal of the cut-off. The cut-off extends, preferably, only through the central part of the cylindrical portion of the drum, and the space where it enters the drum is narrowed by means of side wings I. The incline G is adjustably mounted upon a curved support G′, pivotally secured at one end and adjustably held in position by a regulating-screw l.

Fixedly supported by an arm J within the upper portion of the drum is the collecting-pan K, which receives the concentrate, as will be hereinafter explained. It is inclined and has a discharge-pipe O, which leads to the outside for carrying away the concentrate. A suitable water-jet L may also be arranged above the pan to discharge water thereon to facilitate the discharge of the concentrate.

In the rear end of the drum are arranged two sets of spirally-twisted blades, forming scoops M, one set grouped around the central trunnion in the discharge end of the innermost shell and projecting outwardly into the discharge-opening g, and the other set, N, grouped around the set M in the space between the shells i and d and communicating through openings in the shell d with the scoops of the inner set.

The parts being constructed and arranged as shown and described, they are intended to operate as follows: The material may be in-

troduced dry or in admixture with more or less water. In the latter case a fixed amount of water is always retained in the lower part of the drum up to the height of the outlet *g*, this keeping the two inner shells partly submerged, the inlet *f* being made sufficiently smaller than the outlet to prevent the water from overflowing in front. The material being fed into the innermost shell and the drum being revolved, the material is first subjected to a screening process, and the particles which are small enough to pass through the meshes of the screen (or the perforations of the shell) are retained in the drum, while the coarser debris is carried directly to the rear end and is thrown out through the discharge-opening *b* by the scoops M. The material which passed through the screen largely falls into the shell *d*, and from there it is gradually carried into the cylindrical portion of the outer shell. All the while the material has been kept in rolling motion, and the result of this, aided by the presence of the water (in using the wet process) through which the material has to drop while on its way to the bottom, effects a separation—that is to say, the heavier or metallic particles will seek to collect on the bottom and form the substratum, while the lighter or non-metallic particles remain on top thereof. Not only this, but on account of the lighter or non-metallic particles being more mobile than the specifically heavier particles it will be found that the latter will collect on the bottom and in advance of the former. Thus the motion of the drum being in the direction shown by the arrow in Fig. 1, the bulk of the metallic particles will be on the left or ascending side of the drum and reach farther up thereon than the lighter particles, which are farther behind. This being the condition in which the material is contained in the drum, the cut-off is pushed in by the arm D striking the incline G just at the point where it will divide the metallic from the non-metallic particles, and thus in the further rotation of the drum it will prevent the concentrate thus separated from sliding back and will carry it up high enough to cause it to drop into the pan K, from which it will be discharged through the pipe O to the outside. After the discharge of the concentrate into the pan K the cut-off is again withdrawn by the action of the incline H. The depth of penetration of the cut-off may be regulated by the adjusting-screw *l*, and by the adjustment of the wedge G its actuation can be advanced or retarded. As the material in the bottom of the cylindrical portion of the drum accumulates to a certain depth and rises above the height of the shoulder *h'* it will naturally spread out onto the bottom of the tapering portion *i* of the outer casing, and the lighter material or debris on top will be carried by the screw conveyer into the scoops N, which discharge it into the scoops M, from which they are discharged through the outlet.

The screw conveyer *j* has a considerable clearance within the shell *i*, and whatever metallic particles should happen to be carried off by the debris have still a chance to escape by settling to the bottom of the shell *i*, from whence the action of gravity will carry them back into the cylindrical portion.

While I have described and shown but one cut-off, there may be two or more spaced at equal distances apart.

It will be seen that the operation may be carried out with a minimum of water, and the overflow of water through the outlet may therefore be so small that there is no current of water set up in the drum at all. This is an important advantage in the treatment of ore containing float-gold or like particles of metal. My apparatus, however, is not confined to use in connection with water, but may be used for the treatment of dry ores also.

What I claim as my invention is—

1. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum having a cylindrical chamber on the bottom of which the material is carried in its passage through the drum, a variable cut-off mounted in a longitudinal slit in the cylindrical wall of said chamber, a collecting-pan stationarily suspended above the bottom of the chamber and means for actuating the cut-off and retarding or advancing its action.

2. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum having its ends partially closed to retain a quantity of water therein and formed with a cylindrical portion on the bottom of which the material is carried in its passage through the drum and constituting its concentrating-chamber, a cut-off mounted in a longitudinal slit in the cylindrical wall of said chamber, a collecting-pan stationarily suspended above the bottom of the chamber and means for actuating the cut-off and regulating its depth of penetration.

3. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum having a cylindrical portion constituting the concentrating-chamber for the material to be treated, a cut-off mounted in a longitudinal slit in the cylindrical wall of the chamber, a collecting-pan stationarily suspended within said chamber above the bottom thereof, an arm hinged to the outer wall of the drum and carrying the cut-off, and stationary inclines adapted to actuate said arm and cut-off, said cut-off being curved with the axis thereof at the pivot of the arm.

4. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum having a cylindrical portion constituting the concentrating-chamber, a cut-off slidingly mounted in a longitudinal slit in the cylin-

drical wall of said chamber, a collecting-pan for the concentrate stationarily suspended within said chamber above the bottom thereof, an arm pivotally secured upon the outer wall of the concentrating-chamber and carrying the cut-off and inclines stationarily secured in position to actuate said arm and cut-off, said cut-off being curved on a radius having its center at the pivot of the arm.

5. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum having a cylindrical portion constituting the concentrating-chamber, a cut-off slidingly mounted in a longitudinal slit in the cylindrical wall of said chamber, a collecting-pan for the concentrate stationarily mounted within said chamber and provided with means for discharging the concentrate therefrom without the drum, means for projecting the cut-off into the chamber and for withdrawing it therefrom and means whereby the action of the cut-off may be advanced or retarded and its depth of penetration into the chamber regulated.

6. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum having a cylindrical concentrating-chamber provided with a cut-off slidingly mounted in a longitudinal slit in the cylindrical wall of the chamber, an arm pivotally secured upon the drum and carrying said cut-off, said cut-off being curved on a radius with the pivot of the arm and passing through a stuffing-box, an incline adapted to actuate said arm to project said cut-off into the chamber, a curved support pivotally secured to the frame upon which said incline is adjustably mounted, a regulating-screw for adjusting said lever, and a collecting-pan stationarily mounted within the concentrating-chamber and means for withdrawing the cut-off to its normal position.

7. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum mounted in said frame upon a horizontal axis and comprising an outer shell composed of a cylindrical front portion constituting the concentrating-chamber and a tapering rear portion forming at the junction with the front portion an annular shoulder, two inner tapering shells within the tapering portion of the outer shell and projecting freely within the same into the cylindrical portion of the outer shell, the shell adjacent thereto being imperforate and carrying a conveyer-screw and the innermost shell being perforate and tapering inversely thereto, a sluiceway or feed-spout extending through an opening in the front end of the drum into the front end of the perforate shell and means for collecting and removing the concentrate from the concentrating-chamber.

8. In an ore-concentrator, the combination with a supporting-frame, of a revolving drum mounted in said frame upon a horizontal axis and provided with inlet and outlet openings in its opposite ends respectively, said drum comprising an outer shell composed of a cylindrical front portion and of a tapering rear portion, the cylindrical front portion forming a concentrating-chamber and provided with means for collecting and removing the concentrate, two inner shells extending freely within the tapering portion of the outer shell, the one adjacent thereto being correspondingly tapering and provided upon its outer face with a conveyer-screw and the innermost one being tapered inversely thereto and perforated its whole length, a sluiceway or feed-spout extending through the opening in the front end of the drum into the front end of the innermost shell, and two sets of scoops, one in the rear end of the innermost shell and leading to the outlet from the drum and the other in the surrounding space between the other shells and corresponding therewith, the inlet and outlet in the drum being suitably restricted for submerging the material in water during its passage through the drum.

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

JOHN SHIER.

Witnesses:
OTTO F. BARTHEL,
ADOLPH BARTHEL.