A. E. WIGGIN & A. E. WHEELER.

ORE CLASSIFIER.

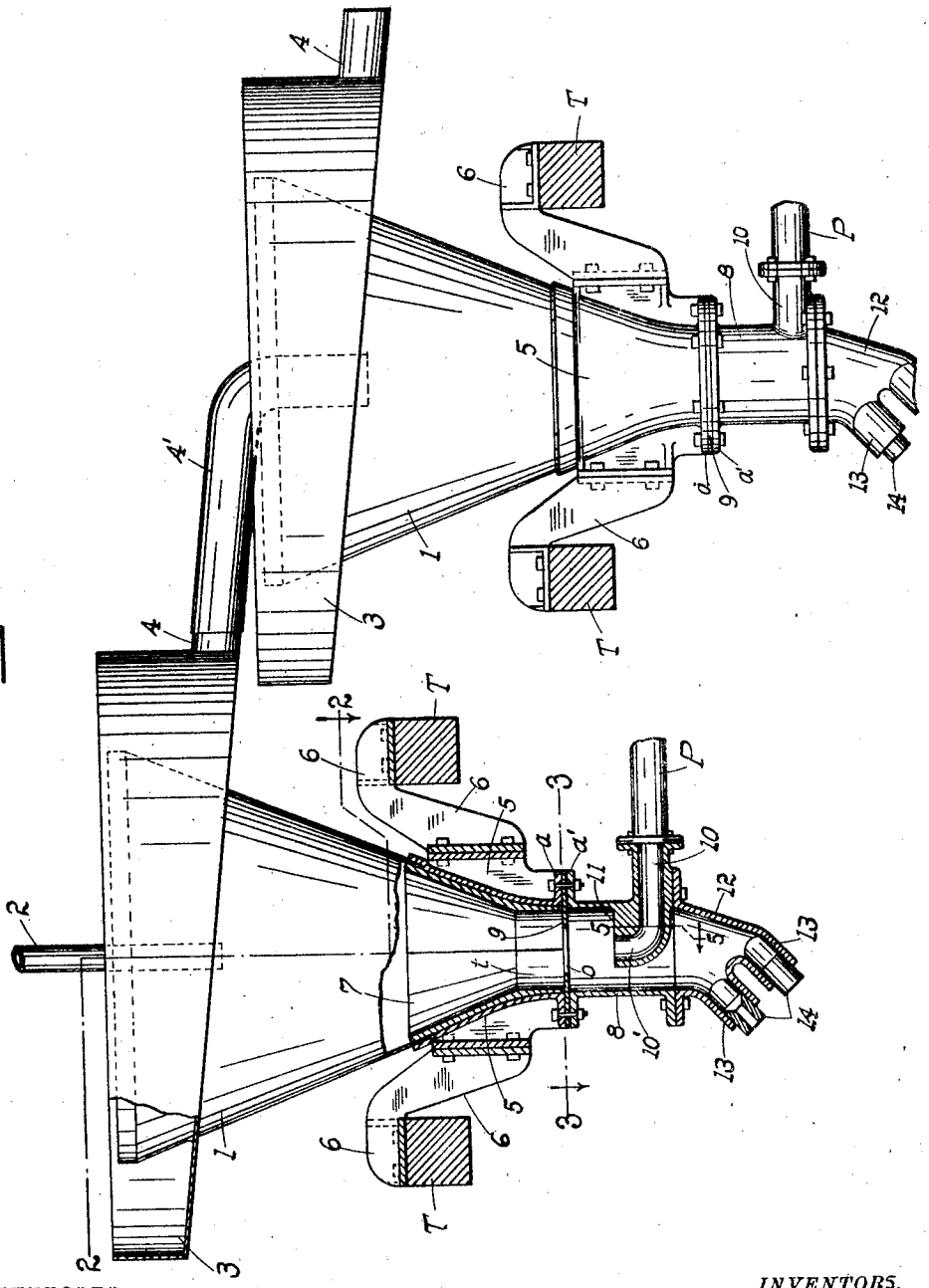
APPLICATION FILED JUNE 27, 1912.

1,058,828.

Patented Apr. 15, 1913.

3 SHEETS—SHEET 1.

FIG. 1.



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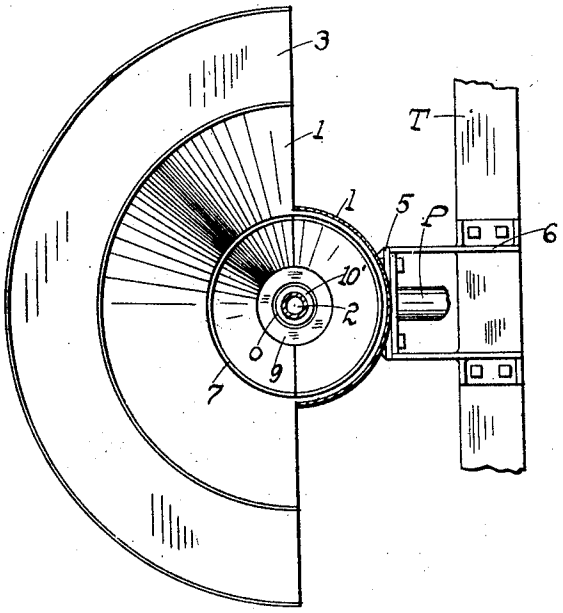
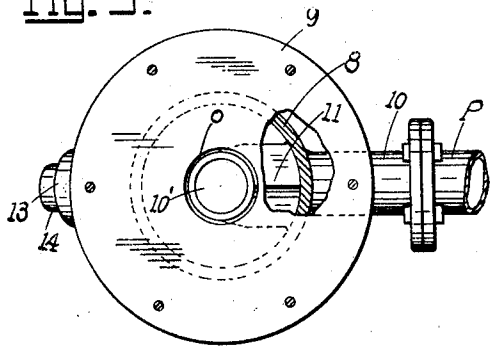


FIG. 2.

FIG. 3.



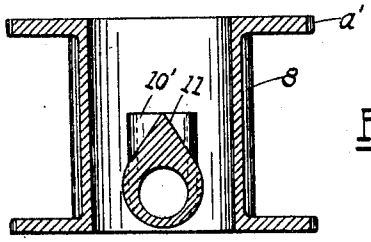
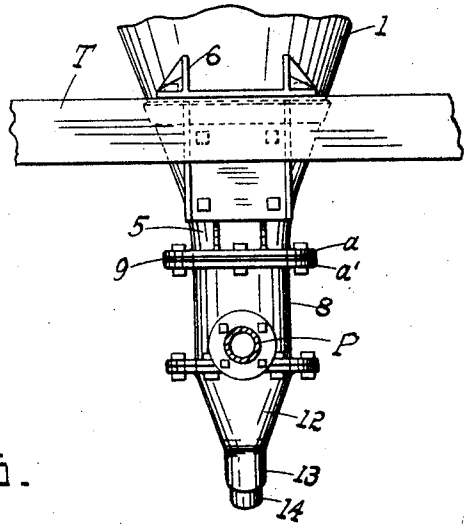


FIG. 5.

FIG. 4.



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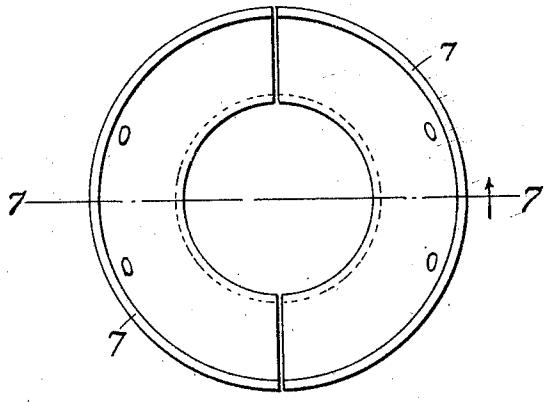


FIG. 6.

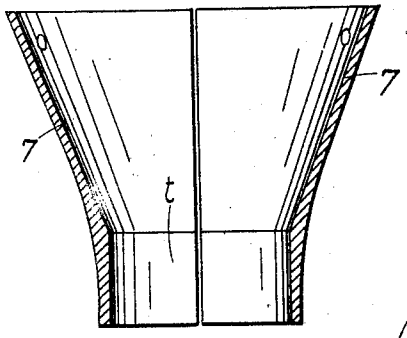
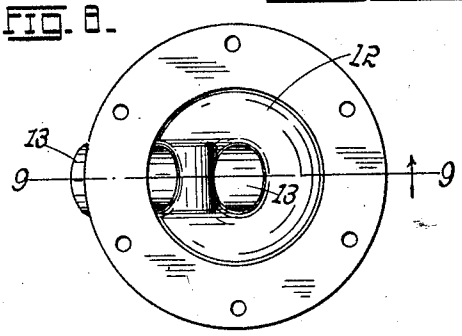


FIG. 7.

FIG. 8.



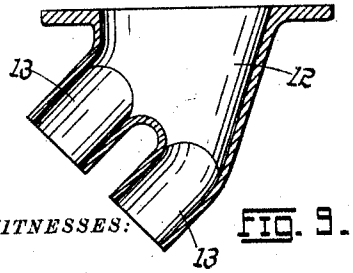


FIG. 9.

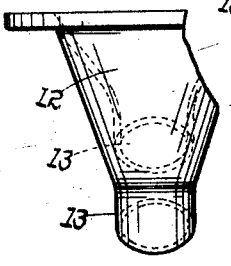


FIG. 10.

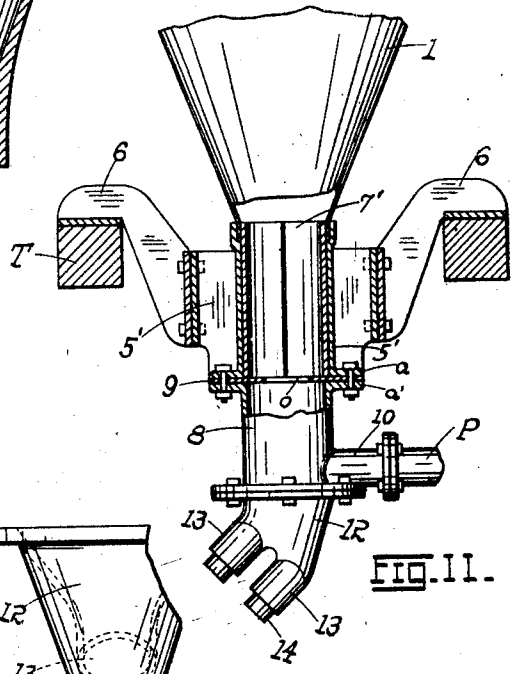


FIG. 11.

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UNITED STATES PATENT OFFICE.

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ORE-CLASSIFIER.

1,058,828. Specification of Letters Patent. Patented Apr. 15, 1913.

Application filed June 27, 1912. Serial No. 706,210

To all whom it may concern:

Be it known that we, ALBERT E. WIGGIN and ARCHER E. WHEELER, citizens of the United States, residing at Great Falls, in the county of Cascade and State of Montana, have invented certain new and useful Improvements in Ore-Classifiers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention has relation to improvements in ore-classifiers; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of a series of two classifiers, parts being in section; Fig. 2 is a combined top plan and horizontal section on the zig-zag line 2—2 of Fig. 1; Fig. 3 is a horizontal section on the line 3—3 of Fig. 1 taken above the constriction plate; Fig. 4 is a view at right angles to Fig. 1 showing the lower portion of the container, the teeter and pressure chambers therefor, and spigot discharge casting, and timber supporting the classifier; Fig. 5 is an enlarged vertical sectional detail on the line 5—5 of Fig. 1; Fig. 6 is a top plan of the sectional hopper liner; Fig. 7 is a middle vertical section thereof on the line 7—7 of Fig. 6; Fig. 8 is a top plan of the discharge casting; Fig. 9 is a middle vertical section thereof on the line 9—9 of Fig. 8; Fig. 10 is a rear elevation of the discharge casting, partly broken; and Fig. 11 is a side elevation with parts in section showing a modified form for the hopper liner and hopper casting.

The present invention relates particularly to what are known as hydraulic ore-classifiers wherein ore-pulp (fine ore mixed with water) is resolved into its respective coarse and fine components capable each of subsequent independent treatment by any known concentrating process.

The object of our improvement is to provide a classifier which will separate to the best advantage, the slimes from the balance of the pulp; one which maintains the most favorable conditions for the separation of the coarse from the fine particles and the separate removal of each from the classifier; one which prevents any material portion of the slimes from escaping with the coarse particles; one in which a uniform rising current is maintained over any given horizontal cross-section of the classifier; one providing a pressure and settling chamber which is free and unobstructed throughout its entire cross-sectional area; one in which the rising current and the pulp feed are disposed along the axis of the classifier thereby permitting the rising current to act to best advantage against the central pulp-feed; one provided with a constriction plate or member separating the settling and pressure chamber from a teeter chamber at the base of the container or "spitzkasten"; and one possessing further and other structural features the advantages of which will be better apparent from a detailed description of the invention which is as follows:—

Referring to the drawings, and for the present to Figs. 1 to 10 inclusive, 1 represents the main classifier chamber or container of which there may be any number connected in series, any chamber constituting however, a classifier in itself, so that a description of one will suffice for all. In Fig. 1 we show a series of two classifiers in which the overflow of the first discharges centrally into the second, and in which the first is provided with a central pulp-feed in the shape of a pipe 2 disposed about the vertical axis of the container and dipping a suitable distance below the surface of the liquid contents of said container. The container is of the prevailing conical or spitzkasten type, and herein overflowing peripherally, said peripheral overflow discharging into a surrounding launder 3. The launder is provided with a discharge spout 4 which, when a series of classifiers are coupled together as shown in Fig. 1, is provided with an extension 4′ dipping centrally into the next classifier, and so on through the series. It may be stated in passing that a number of classifiers may be so connected as to have one receive the heavy particles or spigot discharge, or discharges from the others, should it be desirable to reclassify this spigot discharge in lieu of the light particles or overflow discharge as shown in the illustration here selected.

The container or hopper 1 rests in a bottom hopper-casting 5 to which are secured supporting brackets or arms 6 resting on and bolted to the timbers T. Received by the hopper opposite the casting 5 is a removable hopper-liner 7, cast preferably of

two pieces, the liner 7 as well as the casting 5 having an upper conical portion merging into a bottom cylindrical portion in the preferred form of construction, though they may assume some other shape as presently to be seen. Secured to the basal flange *a* of the casting 5 is the upper flange *a'* of the pressure chamber casting 8, a plate 9 having an opening (or openings) *o* being interposed and secured between the two flanges. This plate or its equivalent, will hereinafter be referred to as the constriction member, the discharge end or ends of the opening or openings thereof being disposed in a plane transverse to the axis of the classifier, the thickness of the member being restricted in order to reduce the zone of constriction, and hence minimize the friction of the flow of the upward current therethrough. In lieu of the plate any equivalent may be substituted therefor, without departing from the spirit of our invention. Formed with the pressure chamber casting 8 is a conduit 10 terminating within the chamber in an upward, central or axial discharge-elbow 10' connected to the chamber wall by a wedge shaped rib 11, the ridge of the rib being presented upward and disposed in the plane of the discharge opening of the elbow, so as to facilitate the downward flow of the heavy particles along the inclined faces of the rib, and prevent their permanent lodgment on the rib. Bolted to the bottom of the pressure chamber 8 is the spigot discharge casting 12, in the present instance shown as provided with two discharge nozzles 13 equipped with usual discharge plugs or spigots 14. To the conduit 10 is secured the feed-water supply pipe P furnishing water under sufficient head or pressure to produce an upward or rising current through the classifier. It may be stated in passing that the cylindrical basal portion of the conical liner 7, forms (immediately above the constriction plate 9) a chamber *t* appropriately designated as a "teeter chamber" because in this chamber the particles are "teetering" more or less in seeking their true positions as determined by the sorting currents, the member 8 being the "pressure chamber."

In Fig. 11 we show a cylindrical hopper liner 7', in which case a corresponding cylindrical hopper casting 5' must be improvised. In other respects the construction does not differ from that already described.

While we have here shown the units (chambers 1, 1) in series, it is obvious of course, that they may be connected up in parallel or in series, or a combination of these, and so set up that the spigot discharge of one may discharge into the next, or the overflow of one may discharge into the next, or any combination of these in a series of classifiers. The form of chamber 1 may of course be conical or pyramidal as obvious to those versed in the art.

From the foregoing it will be observed that the present improvement is characterized by a substantially central or axial downward pulp-feed; an upward central water feed; a teeter chamber; a pressure chamber; a constriction member, and a peripheral overflow.

The operation of the classifier may be described substantially as follows:—Assuming that pulp is introduced into the classifier through the central feed pipe 2 and a rising current of water is flowing into the pressure chamber 8 from the centrally disposed discharge mouth of the elbow 10', the two opposing currents will at some point in the container 1 cause a lateral or radial spreading of the pulp, the rising or sorting current keeping the lighter particles afloat, such particles finally flowing over the upper edge of the container 1 into the launder 3 whence they discharge into the succeeding chamber 1 in which a similar action is taking place. A description of the operation of one unit will therefore suffice for all. The water column rising in the pressure chamber 8 in passing the constriction *o* of the member 9 naturally increases in velocity across the zone of constriction, such increase being in a measure continued into the teeter chamber *t* through which the heavier particles are gravitating toward the constriction and through which they eventually pass into the pressure chamber 8. The increased current velocity across and just above the constriction *o* naturally permits only such particles to gravitate through the constriction as are heavy enough to overcome the rising water column, the lighter particles being rejected and segregated from the heavier and compelled to finally find their way out with the peripheral overflow from the classifier. It is this elimination of the lighter from the heavier particles above the constriction member which causes the teetering of the particles in the chamber *t*, a particle once rejected again seeking to fall so that there is a constant rising and falling or teetering of the particles in said chamber. In the absence of a specific teetering chamber (due to the elimination of the perforated constriction member 9) the sorting or classification would not be so well defined or as uniform as some light particles would then find their way down and mingle with the concentrates. Once the heavy particles find their way into the pressure chamber, they readily overcome the reduced rising current, falling through the same, past the mouth of the elbow 10' and over the wedge-shaped rib 11 into the chamber of the discharge casting 12 whence they escape through the plug or plugs 14.

By having a peripheral overflow (that is, over the entire upper edge of the classifier)

the rising currents are rendered more uniform throughout the cross-section of the classifier than would be the case where the overflow was over a part of the periphery. It will be observed that the pressure chamber 8 is free and unobstructed above a plane passing across the mouth of the elbow 10′, so that the entire cross-section of the chamber is available for the gravitation of classified material. It will further be observed that the height of the constriction *o* is limited to that thickness or zone in passing which, only sufficient acceleration is imparted to the rising current to impose the necessary function on the teeter chamber, that is to say, the function of segregating the lighter particles from the heavier particles, the acceleration being restricted to said chamber. It is in effect a segregating chamber.

The pulp-feed being central (or axial) and in opposition to a correspondingly central or axial upward water-feed, it follows that at the point of approaching neutralization of these opposing currents, the pulp will spread radially outward and upward, the lightest particles flowing over the edge of the container, and the heavier falling toward the chamber *t*, where they in turn become properly segregated or sorted, as described. Obviously, though called an ore-classifier, its application is not to be restricted to the treatment of "ores" but may be employed for classifying any material to which the apparatus is applicable.

Having described our invention, what we claim is:—

1. An ore classifier comprising a suitable container having a bottom discharge means for heavy particles and a peripheral overflow, a central pulp-feed for the container, a pressure chamber interposed between the container and bottom discharge means and establishing free communication between them, means for introducing a column of water through the walls of the pressure chamber into the container and confining said column to a central upward flow in opposition to the pulp-feed, a chamber above the pressure chamber for segregating the light from the heavy particles, and a perforated constriction member interposed between, and separating the aforesaid chambers, and conducting the heavy particles to the pressure chamber.

2. An ore classifier comprising a suitable container having a bottom discharge means for heavy particles and a peripheral overflow, a central pulp-feed dipping below the surface of the contents of the container, a pressure chamber interposed between the container and bottom discharge means and establishing free communication between them, means for introducing a column of water through the walls of the pressure chamber into the container and confining said column to a central upward flow in opposition to the pulp-feed, a chamber above the pressure chamber for segregating the light from the heavy particles, and a perforated constriction member interposed between, and separating the aforesaid chambers, and conducting the heavy particles to the pressure chamber.

3. An ore classifier comprising a suitable container having a bottom discharge means for heavy particles and a peripheral overflow, a pulp-feed directing the pulp downwardly through the container, a pressure chamber interposed between the container and bottom discharge means and establishing free communication between them, means for introducing a column of water through the pressure chamber into the container and confining said column to an upward flow in opposition to the downward flow of the pulp-feed, a chamber above the pressure chamber for segregating the light from the heavy particles, and a perforated constriction member disposed across the top of the pressure chamber between the latter and the segregating chamber, and operating to conduct the heavy particles to said pressure chamber.

4. In an ore classifier, a pressure chamber provided with a conduit terminating in a central axial-discharging elbow, and a wedge-shaped rib spanning the space between the elbow and chamber wall, the ridge of the rib being disposed in the plane of the discharge opening of said elbow.

In testimony whereof, we affix our signatures in presence of two witnesses.

ALBERT E. WIGGIN.
ARCHER E. WHEELER.

Witnesses for Albert E. Wiggin:
WILLIAM C. CAPRON,
FREDERICK LOIST.

Witnesses for Archer E. Wheeler:
TIMOTHY P. CORCORAN,
WILLIAM H. BEARD.