

Aug. 19, 1924.

A. H. STEBBINS
CONCENTRATOR

Filed April 11, 1922

1,505,740

Fig. 1

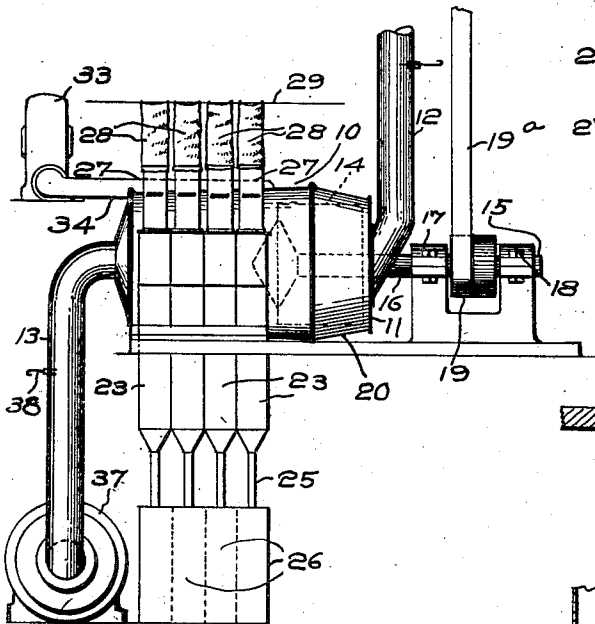


Fig. 2

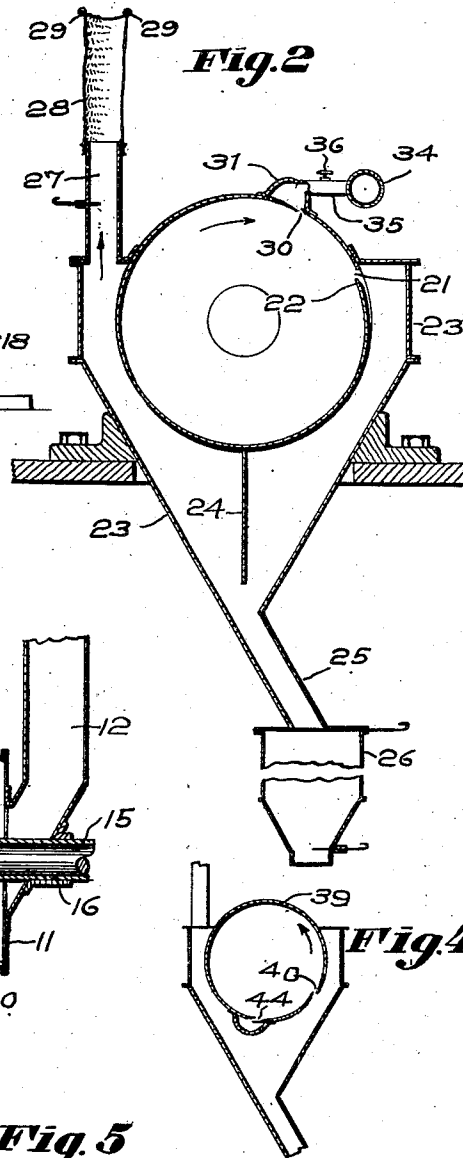


Fig. 3

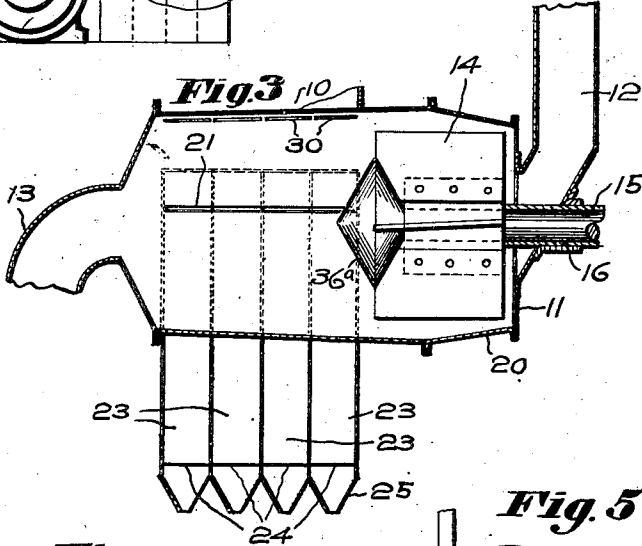


Fig. 4

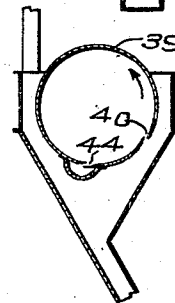


Fig. 5

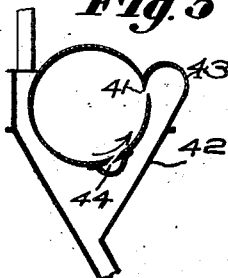
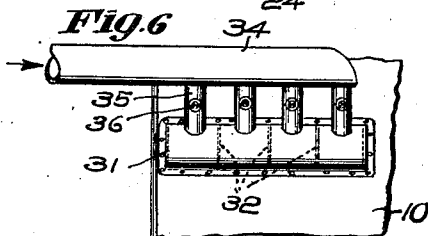


Fig. 6



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UNITED STATES PATENT OFFICE.

ALBERT H. STEBBINS, OF LOS ANGELES, CALIFORNIA.

CONCENTRATOR.

Application filed April 11, 1922. Serial No. 551,595.

To all whom it may concern:

Be it known that I, ALBERT H. STEBBINS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented an Improvement in Concentrators, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to concentrators of the type in which the materials to be treated are caused to whirl about the interior of a container.

Concentrators are adapted to separate materials by reason of their differences in specific gravity, shape or frictional properties, or by a combination of two or more of these properties, and are extensively used in the treatment of ores to separate the values from the usual impurities.

Most ores have their values distributed throughout a relatively large amount of impurities or foreign matter, and as a result the values obtained usually constitutes a small portion of the mass of materials treated. It is therefore important to reduce as far as practical the labor involved in treating this mass of materials, and at the same time to remove the values as completely as possible.

In ore treating mills it is usually desirable to concentrate the materials at various stages of the ore treatment, and the materials are commonly subjected to the first concentration operation while the particles are relatively large in size so that some of the values or concentrates may be removed at this stage, while other values or concentrates are removed at succeeding stages as the materials are reduced in size.

Some of the values in the materials being treated may be very fine in size, and the concentrator of the present invention is designed more particularly for the treatment of ores or other materials that have been reduced to a fine size. The values or concentrates in most cases have a higher specific gravity than the accompanying impurities, and one important feature of the present invention consists in means for causing the materials to be treated to whirl about the interior of a drum or casing so that the heavier particles will be thrown outwardly toward the walls of the drum and removed through an opening in a wall thereof.

Another feature of the invention resides in the construction of the drum or casing and the means for directing air carrying the materials to be treated lengthwise of the drum with a whirling movement.

Still another feature of the invention resides in means for receiving, at various points along the drum, the materials thrown outwardly by centrifugal force.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate one good practical form thereof.

In the drawings:—

Fig. 1 is a side elevation of a concentrator constructed in accordance with the present invention.

Fig. 2 is an enlarged sectional view taken transversely through Fig. 1;

Fig. 3 is an enlarged, longitudinal sectional view through Fig. 1;

Fig. 4 is a vertical sectional view of a modification of the invention;

Fig. 5 is a vertical sectional view of a second modification; and

Fig. 6 is a fragmentary top plan view of Fig. 2.

In the embodiment of the invention illustrated a substantially cylindrical drum or casing 10 is provided having a head 11 at one end thereof and a conduit 12 for introducing air through the head. At the other end of the drum 10 is provided a conduit 13 for conducting air from the drum. The materials to be treated may be introduced into the air passing through the conduit 12 at any desired point and by suitable means (not shown).

The air carrying the materials to be treated into the drum 10 should travel lengthwise of the drum with a whirling movement so that the heavier materials will be thrown outwardly toward the walls of the drum by centrifugal force. Various means may be provided to impart the desired movement to the air, and in the present case a fan 14 is provided within the drum 10 adjacent the head 11. The fan is mounted upon a shaft 15 extending in the direction of the axis of the drum, and this shaft may extend through a boxing 16 upon the conduit 12 and may be rotatably mounted in bearings 17 and 18. The shaft may be driven by a pulley 19 and belt 19^a or other

suitable means, and as the fan is rotated by the shaft, air and the materials to be treated will enter the drum 10 about the shaft 15 and will be forced outwardly toward the walls of the drum by the blades of the fan. This imparts a whirling movement to the air within the drum, and in order to direct the air longitudinally of the drum the blades are given a slight twist or spiral construction as shown in Fig. 3. Movement of the air lengthwise of the drum is further facilitated by the tapered wall 20 at the end of the drum which surrounds the fan.

The whirling movement imparted to the air serves to throw the heavier particles within the air outwardly toward the walls of the drum, and in the construction shown the drum is provided with a slot 21 extending longitudinally thereof through which these particles may escape. A lip 22 preferably is provided which extends into the drum sufficiently to direct through the slot 21 the materials traveling close to the wall of the drum. The materials that enter the slot 21 near the fan will possess a greater specific gravity than the materials that enter the slot further along its length, because the heavier particles will be thrown outwardly more rapidly than the lighter particles. It is therefore desirable to grade the materials that pass through the slot 21 by directing them into different containers, and to this end, a series of receptacles 23 are provided arranged along the slot to receive the materials passing through the slot.

The number of receptacles provided may vary as desired, four being shown in the drawings, and each receptacle may have the construction shown in section in Fig. 2. Each of these receptacles extends around a substantial portion of the drum 10 and a part thereof forms a housing extending over the slot 21 so that the materials entering the receptacle will move downwardly into the lower tapered portion thereof. It is desirable to arrest the whirling movement of the air that enters the receptacles 23 so that the particles within the air will settle, and to this end one or more baffle plates 24 may be provided within the receptacles in position to prevent the air from traveling along the outer walls of the drum 10 from the slot 21 to an outlet to be described. The materials that settle within the receptacles 23 may be removed therefrom through the spouts 25 preferably leading into closed bins 26 that prevent the air from escaping through the spouts. The air that enters the receptacles 23 after having its velocity retarded by the baffle plates 24, may escape therefrom through the conduits 27 extending upwardly from the receptacles, and each conduit preferably has a cloth bag 28 secured to its end to arrest the particles remaining in the air. The bags 28 preferably are held

in an inverted position above the conduits 27 by rods 29 so that the materials within the bags will fall downwardly into the receptacles 23.

The heavier particles thrown outwardly within the drum may carry with them some of the finer particles and it is desirable to prevent these finer particles from escaping through the slot 21 with the heavy particles. To this end, auxiliary slots 30 are provided through a wall of the drum 10 in spaced relation to the material receiving slot 21, and air is forced through the slots 30 so that it will strike the materials traveling adjacent to the wall of the drum and will deflect these materials inwardly. A case 31 is secured to the outer face of the drum 10 over the slots 30 and preferably is divided into separate compartments by partitions 32. Air is forced into these compartments by a fan 33 having a conduit 34 and pipes 35 leading from the conduit to each compartment. Valves 36 within the pipes 35 serve to regulate the pressure of the air discharged from each slot 30, and the air discharged from the slots should be so adjusted that it will deflect the lighter materials inwardly sufficiently to prevent them from escaping through the slot 21 while the heavier particles will be deflected inwardly to a less extent.

Passage of the fine particles through the slot 21 may be further prevented by connecting the discharge conduit 13 with a fan 37, or other means for drawing air from the interior of the drum 10, and the amount of suction desired may be obtained by adjusting the gate 38. This suction means differs in operation from the blast means that delivers the laden air into the casing 10, in that the fan 14 forces the laden air outwardly and longitudinally of the casing with a whirling movement while the suction means removes the air from the central portion of the casing from which the heavier materials have been removed. By providing both the blast and suction means the whirling force imparted to the air may be varied as desired by varying the speed of the fan 14, and the suction means may be regulated to withdraw air from the central portion of the casing 10 with sufficient force to draw inwardly and remove the lighter particles from adjacent the walls of the drum without removing the heavier particles.

The heavy particles thrown outwardly by the whirling movement of the air within the drum will possess greater momentum than the light particles and as a result, the suction produced within the drum 10 by the exhaust fan 37 may be so adjusted that it will serve to remove the air and lighter particles from the central portion of the drum, and also to draw inwardly the lighter materials traveling around the drum adja-

cent the walls thereof without drawing inwardly the heavier particles. By properly adjusting the suction produced within the drum the fine materials may be separated from the heavier particles with a high degree of efficiency, and the particles passing through the slot 21 at different points lengthwise thereof will enter different receptacles 23 in the form of different grades.

10 Passage of the heavier materials through the slot 21 and removal of the lighter materials from adjacent the walls of the drum may be facilitated by tapering the drum slightly towards its delivery end as shown in Fig. 3. And the fan 14 preferably is provided with a deflecting head 36^a at its forward end which may be secured to the fan blades, and is constructed to direct the air delivered by the fan outwardly toward the walls of the drum.

In the concentrator construction of Figs. 1, 2, and 3, the fan 14 should be rotated sufficiently fast to impart a strong whirling movement to the air in the drum 10 so that the heavier particles will be thrown outwardly by centrifugal force. In some cases, however, it may be desirable to rely largely upon gravity to effect the desired classification. This may be accomplished by the modified construction of Fig. 4 wherein a drum 39 is provided having a fan or other suitable means for imparting whirling movement to the air in the direction indicated by the arrow. In this construction the whirling movement of the air should be relatively weak so that the heavier particles will fall by gravity through the slot 40 while the lighter particles will be carried upwardly by the air past this slot and around the drum.

The concentrator of Fig. 5 is substantially the same in construction and operation as the machine of Figs. 1, 2, and 3, but the air moves in the opposite direction as will be apparent from the arrows shown in Figs. 2 and 5. The lip 41 of Fig. 5 is therefore shown as extending down instead of upward, and the receptacle 42 is provided with an enlargement 43 to receive the materials passing upwardly through the slot.

The constructions shown in Figs. 4 and 5 may be provided with auxiliary slots 44 through which air may be forced to deflect the lighter materials inwardly as in Figs. 1, 2, and 3.

What is claimed is:

1. A concentrator comprising, in combination, a drum having a discharge slot extending longitudinally of a wall thereof, means for delivering air carrying the materials to be treated into the drum to travel lengthwise thereof with a whirling movement that the heavier particles may be thrown outwardly by centrifugal force toward the walls of the drum and pass out-

wardly through the slot, receptacles arranged along said slot to receive the materials discharged through different portions thereof, and means for discharging from the receptacles the air that enters said slots, comprising upwardly extending conduits provided with porous covers for arresting the particles within the air.

2. A concentrator comprising, in combination, a drum having a narrow discharge slot extending longitudinally of a wall thereof, a fan rotatably mounted within an end of the drum to deliver air carrying the materials to be treated into the drum to travel lengthwise thereof with a whirling movement, a lip at said slot extending into the drum in a direction to deflect through the slot the heavier particles thrown outwardly by centrifugal force and whirling with the air near the wall of the drum, a series of receptacles positioned along said slot to receive the materials passing through different portions of the slot, and means for introducing a jet of air into the drum through a side wall thereof and near said slot to direct inwardly away from the slot the lighter materials approaching the discharge slot.

3. A concentrator comprising, in combination, a drum having a discharge slot extending longitudinally of a wall thereof, a fan rotatably mounted within an end of the drum to deliver air carrying the materials to be treated into the drum to travel lengthwise thereof with a whirling movement, a lip at said slot extending into the drum in a direction to deflect through the slot the heavier particles thrown outwardly by centrifugal force and whirling with the air near the wall of the drum, means for introducing jets of air into the casing in a row near said slot to direct inwardly away from the slot the lighter materials approaching the discharge slot, and means for varying the strength of the air issuing from the different jets.

4. A concentrator comprising, in combination, a casing having a narrow discharge slot extending longitudinally of a wall thereof, a fan at one end of the casing and rotatable about an axis extending longitudinally of the casing to force air bearing the materials to be treated longitudinally of the casing with a whirling movement to throw the heavier particles outwardly by centrifugal force against the walls of the casing, a lip at said slot extending into the casing in a direction to deflect through the slot the heavier particles whirling therein adjacent the wall of the casing, and the casing having a second slot formed in its wall near the first slot and means for forcing air there-through in the form of a jet to direct inwardly away from the slot the lighter materials approaching the discharge slot.

5. A concentrator comprising, in combination, a horizontally extending drum having a discharge slot extending longitudinally of a wall thereof, means for forcing air bearing the materials to be treated into the drum through one end thereof to travel lengthwise of the drum with a whirling movement to throw the heavier particles outwardly against the wall of the drum, a lip at said slot extending into the drum in a direction to deflect through the slot the heavier particles traveling near the wall of the drum, a series of receptacles arranged along the drum over the slot to receive the materials passing through different portions of the slot, baffle means within the receptacles for arresting the whirling movement of the air that enters the receptacle, means for discharging air from the receptacles at an elevated point remote to the slot, and means for introducing a jet of air into the drum through a wall near said slot to direct inwardly away from the slot the lighter materials approaching the discharge slot.

In testimony whereof, I have signed my name to this specification.

ALBERT H. STEBBINS.