May 22, 1934. L. B. GOLDBERG ET AL 1,960,085

COMBINED SCREENING AND CONCENTRATING DEVICE

Filed Nov. 18, 1932 2 Sheets-Sheet 1

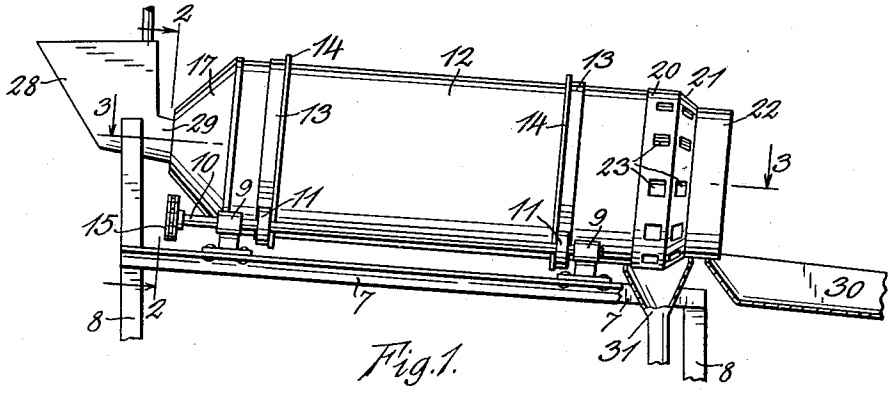


Fig. 1.

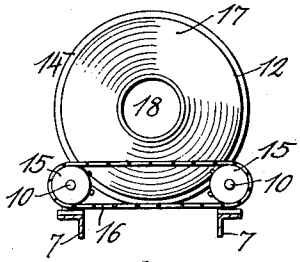


Fig. 2.



Fig. 5.

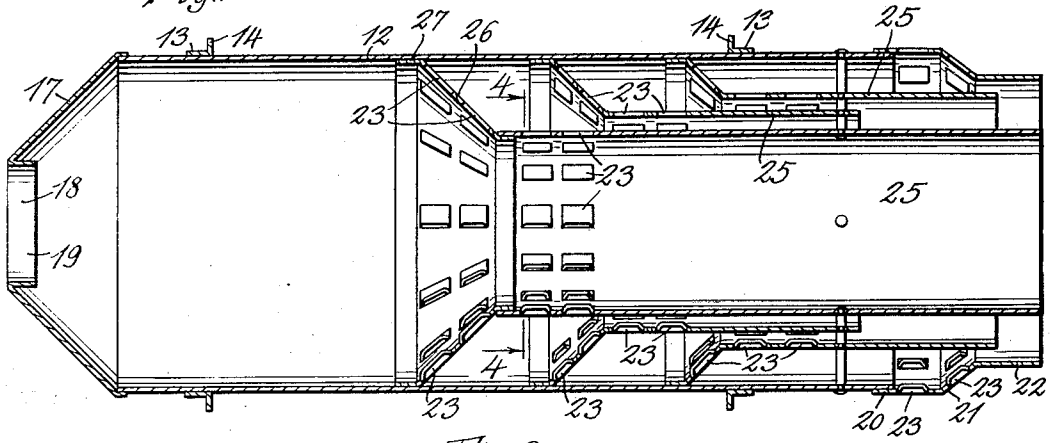


Fig. 3.

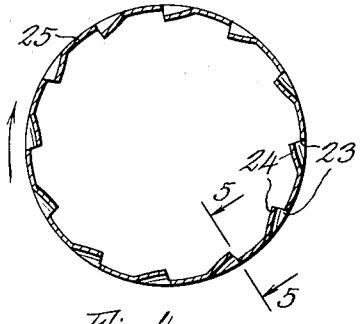


Fig. 4.

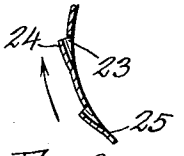


Fig. 6.

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COMBINED SCREENING AND CONCENTRATING DEVICE

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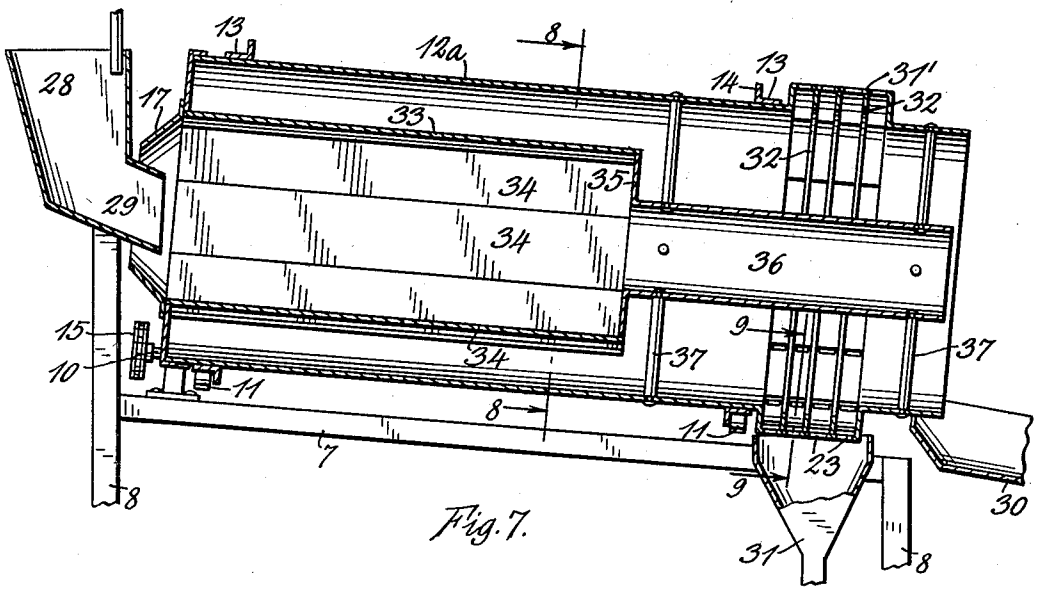


Fig. 7.

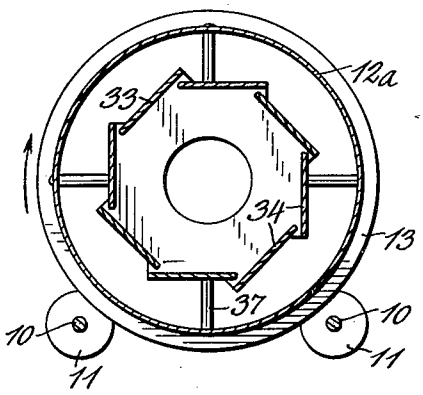


Fig. 8.

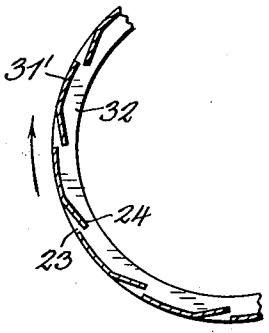


Fig. 9.

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1,960,085

COMBINED SCREENING AND CONCENTRATING DEVICE

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Application November 18, 1932, Serial No. 643,198

12 Claims. (Cl. 209—291)

This invention relates to improvements in rotary screens and concentrators of the type employed in connection with placer mining.

In many parts of our country free gold occurs in gravel and sand and can be separated by subjecting the material to proper handling. It is evident that the gold particles form only a small fraction of the material and it is therefore necessary to handle a large amount of gravel or sand during the placer mining operations.

In placer mining it is customary to run the gravel over grizzlies and through rotary screens so as to remove the larger particles after which the smaller particles, that contain the free gold, are subjected to concentration by different types of machines.

It is an object of this invention to produce a combined screen and concentrator that shall have a very large capacity and which shall be so constructed that the fine material with which the gold is mixed is subjected to one or more washing and screening operations while in the cylinder so as to be delivered in very highly concentrated form.

Another object of this invention is to produce a screen that shall be so constructed that it will be self-cleaning and which will therefore remain in operative condition at all times.

A still further object of this invention is to produce a simple and substantial screen and concentrator that can be readily transported and which will deliver the concentrates in a well washed and therefore highly concentrated condition, and which, in addition shall be so constructed that the parts that are subjected to wear can be readily removed and replaced.

The above and other objects that may become apparent as this description proceeds are attained by means of a construction and an arrangement of parts that will now be described in detail, and for this purpose reference will be had to the accompanying drawings in which the preferred embodiment of the invention has been illustrated, and in which:

Fig. 1 is a side elevation of the improved screen and concentrator that forms the subject of this invention;

Fig. 2 is a section taken on line 2—2, Fig. 1;

Fig. 3 is a longitudinal diametrical section taken on line 3—3, Fig. 1;

Fig. 4 is a transverse section taken on line 4—4, Fig. 3;

Fig. 5 is a section taken on line 5—5, Fig. 4;

Fig. 6 is a fragmentary view of a portion of the cylinder showing a slightly modified form of construction;

Fig. 7 is a section similar to that of Fig. 3 and shows a modified form of construction;

Fig. 8 is a section taken on line 8—8, Fig. 7; and

Fig. 9 is a section taken on line 9—9 Fig. 7.

In the drawings reference numeral 7 represents a supporting member of a framework that is provided at spaced positions with supporting legs 8. Since the framework forms no part of this invention and has been shown more or less diagrammatically, no detailed description of this part of the drawings will be made.

Supported on the upper flanges of members 7 are bearings 9 in which are journalled the shafts 10. Each of the shafts are provided with rollers 11 on which the rotating drum 12 is supported. The drum 12, which has the shape of an elongated cylinder, is provided with tracks 13 that are preferably formed from angle irons and in which the flanges 14 extend outwardly. The distance between the outer surfaces of flanges 14 is approximately the same as the distance between the adjacent surfaces of the rollers 11 and when the drum is positioned as shown in Figs. 1 and 2, the cylindrical flanges of members 13 rests on the rollers and the radial flanges extend outwardly and serve to hold the drum in position. The ends of shafts 10 are provided with sprocket wheels 15 that are connected by means of a sprocket chain 16. One of the shafts is rotated by means of a motor or an internal combustion engine, but this rotating means has not been shown because it forms no part of the invention.

The shafts 10 are inclined in the manner shown in Fig. 1 so that the cylindrical drum 12 will also be inclined when in place on the rollers.

Referring now more particularly to Figs. 3, 4 and 5, it will be seen that the drum 12 is cylindrical and that its upper end is closed by a wall 17 that is frusto-conical and which is provided with a central opening 18 whose outer wall is formed by an inwardly extending flange 19. The lower end of the cylindrical drum is formed by a screening section having a cylindrical portion 20 and a frusto-conical portion 21 whose smaller diameter end is connected with the cylindrical discharge section 22. The two sections 20 and 21 are provided with openings which have been designated by reference numeral 23. The openings are formed by cutting the material in the direction of the axis of rotation and the bending of one side of the metal either inwardly or outwardly in the manner shown in Figs. 5 and 6. The bent portion has been designated by reference numeral 24.

From Fig. 4 it will be seen that the edge of the opening that projects in the direction of rotation is farther removed from the center of rotation than the opposite edge which is part of the bent portion 24. It will be evident from Figs. 4 and 6 that if the drum is rotated in the direction of the arrows and contains pulp or a mixture of gravel and sand, the pulp or gravel will roll downwardly and will not come into contact with the side of the opening that is farthest removed from

the center of rotation and therefore there will be no tendency for the solid materials to get caught in the openings and clog the same. Any gold or other heavy particles that are small enough to pass through the openings will flow through with the water that is employed. From Fig. 3 it will be seen that the two sections of wall 20 and 21 have both been provided with openings of the type described.

Located within the rotating cylinder are a number of screening members each consisting of a cylindrical discharge portion 25 and a frusto-conical wall 26. The smaller end of the wall 26 is welded or otherwise secured to the inner end of the cylindrical portion and its larger end is formed into a cylindrical flange 27. In the drawings three screening members have been shown, each constructed in the manner just described. Each of the frusto-conical walls 26 is provided with a number of openings 23 constructed in the manner shown in Figs. 4, 5 and 6 and described above. The inner ends of the cylindrical members 25 are also provided with one or more rows of openings like those already described.

The material is fed into the rotating drum through a hopper 28 that has a cylindrical portion 29 which extends through the opening 18 in the manner shown in Fig. 1.

When the drum is rotated in the direction indicated by the arrows in Figs. 4 and 6 and gravel or sand mixed with free gold is introduced through the hopper, the mixture of sand and water will be agitated in that portion of the drum nearest the intake and the larger particles of gangue, such as gravel and rock, will pass into the innermost of the tubes 29 and be discharged into a launder 30 which carries them to a dump. The smaller particles will pass through the openings 23 into the chamber between the first and the second frusto-conical screening walls where these particles will be further subjected to agitations and washing with the result that the lighter particles will flow outwardly between the innermost member 25 and the next cylindrical member and the gold and heavier particles will pass into the second chamber where a similar agitation and screening effect will take place after which the gold and heavier particles pass into the third chamber and finally leave through the openings in wall sections 20 and 21 from which they pass into a launder 31 and are transferred to a concentrating table or subjected to any further concentrating action that may be found necessary.

The invention to which this application relates is shown most clearly in Fig. 3 from which it will be seen that the cylindrical drum is provided with one or more screening sections, each of which has the general appearance of a funnel and consists of a frusto-conical wall whose outer edge is connected with the inside of the drum and whose inner edge is connected with a cylindrical discharge tube 25. As many of these screening sections may be used as is found to be necessary to obtain the best results. The repeated washing and screening of the material as it passes through the drum and screening sections produces a concentrate that is very rich in gold and which can be still further concentrated after it leaves the launder 31.

In Figs. 7, 8 and 9 a slightly modified form of construction has been shown. In this modification the drum 12*a* has an enlarged section 31' near its lower or discharge end. Section 31' is provided with a plurality of rows of openings 23 which are separated by rings 32 in the manner shown in Fig. 7. Instead of the screening device illustrated in Fig. 3, the screening device employed in this modified form consists of a substantially cylindrical screening section which has been designated as a whole by reference numeral 33. This section is preferably formed from a plurality of plates 34. The plates 34 shown in Figs. 7 and 8 are flat and are so arranged that the leading edges of the plates project beyond the following edges as shown and by which construction it is apparent that the radial distance from the center of rotation to the edges of the plates that extend in the direction of rotation is greater than the radial distances to the following edges of the plates, and therefore the self-cleaning action described in connection with Figs. 4, 5 and 6 is obtained by this construction. By making the screening section as shown in Figs. 7 and 8, it is possible to employ thick plates which could not readily be bent as shown in Figs. 4 and 6 and this construction is therefore adapted more particularly to the larger types of machines. The lower end of cylinder 33 is connected by means of a ring 35 with the upper end of a discharge cylinder 36. Cylinder 36 is held in axial aligned position in the drum 12*a* by means of spacers 37 or any other equivalent means.

When the construction shown in Figs. 7, 8 and 9 is used, only one screening device is provided, although it is possible to employ two or more in a manner somewhat analogous to that shown in Fig. 3. With the construction shown, any material that passes between the plates 34 is deposited on the inside of drum 12*a* and is washed down into the interior of the enlarged section 31, and since the drum is rotating in the direction shown in Fig. 9, the smaller materials will be washed out through the openings 23 in the manner explained in connection with the operation of the device illustrated in Fig. 3.

Particular attention is called to the self-cleaning action of the openings 23 which is obtained by making these openings long in the direction of the axis of rotation and in bending one side of the metal in such a way that the side of the opening in the direction of rotation is spaced farther from the center of rotation than the opposite side and therefore when the drum is rotating, the material will move away from the opening with the result that it tends to keep the openings clean and prevents clogging. The heavier material such as gold passes through with the wash at the lower side of the drum.

The cleaning action defined in the above paragraph is, of course, present whether a single drum is used or if an assembly like those shown in Figs. 3 and 7 is used.

Owing to friction between the wall surfaces and the water, the latter will be raised on the side towards which the drum rotates and some of this water will flow into the screening drum through the elongated openings as is apparent from an inspection of Figs. 4, 6, 8 and 9.

The length of the drum can be increased to any extent desired and the inclination can be adjusted to get the best results. A screening and concentrating device like the one described has a large capacity and delivers the concentrates in a condition that requires only a comparatively small amount of further treatment to fit them for the smelter.

Of course the material as it is taken from the placer mine can be passed through grizzlies or other screens so as to remove the larger particles before it is subjected to treatment in the machine

here described and by so doing the capacity will be greatly increased.

Having described the invention, what is claimed as new is:

1. A combined rotary screen and concentrator comprising, in combination, a cylinder mounted for rotation about its central axis while the latter is inclined with respect to the horizon, the lower end of the cylinder having a discharge section of smaller diameter which is joined to it by an annular wall provided with openings, a screen member located within the cylinder, the screen member comprising a cylindrical section that is concentric with the cylinder and a frusto-conical section secured at its smaller end to the end of the cylindrical screen section and at its larger end to the inside of the cylinder, the frusto conical surface inclining inwardly in the direction of the discharge end, the frusto-conical section having openings, the annular wall connecting the lower end of the cylinder with the cylindrical discharge section being also provided with openings, and means for turning the assembly about its inclined axis.

2. A combined rotary screen and concentrator comprising, in combination, a cylindrical drum mounted for rotation about its central axis which is inclined with respect to the horizon, means for feeding material into the upper end of the drum, the lower end of the drum having a cylindrical discharge section, a plurality of screening members located in the drum, each screening member having a cylindrical discharge section and a frusto-conical screening wall member secured to the inner end of the discharge section, the outer edges of the frusto-conical wall members being secured to the inside of the drum, the screening wall members having openings through which the finer materials will pass, the discharge section of the drum being provided with openings through which the concentrates may pass, and means for turning the drum.

3. A device in accordance with claim 2 in which the openings in the drum and in the frusto-conical members are elongated in the general direction of the axis of rotation and in which the edge of the material forming the side of the opening that points in the direction of rotation is farther from the center of rotation than the opposite side of the opening whereby a cleaning action is obtained during operation.

4. A combined screening and concentrating device, comprising, a cylindrical drum mounted for rotation about its longitudinal axis and inclined with respect to the horizon, the upper end having a closure provided with an intake opening, the lower end of the drum having a cylindrical discharge section of smaller diameter than the drum and connected with the latter by an annular wall section, a screen member located in the drum, said member comprising a cylindrical member of smaller diameter than the discharge section of the drum, means for holding the cylindrical member concentric with the discharge section, the upper end of the cylindrical member being connected with the inside of the drum by means of a frusto-conical wall which has openings through which material may pass into the lower part of the drum, the lower part of the drum having a plurality of openings.

5. A combined screening and concentrating device comprising, a cylindrical drum rotatable about its central axis while the axis is inclined with respect to the horizon, the drum having its upper end provided with an opening for the reception of material and the lower end having a discharge opening, the wall of the drum having a plurality of openings, a screening device located within the drum and secured to the latter so as to be rotatable therewith, the screening device having a frusto-conical screen section and a tubular discharge section, the upper end of the screen section being attached to the drum between the intake opening and discharge opening, and the lower end of the screen section being connected to the upper end of the tubular discharge section, the wall of the screen section having a plurality of openings.

6. A combined screening and concentrating device comprising, a cylindrical drum rotatable about its central axis while the axis is inclined with respect to the horizon, the drum having its upper end provided with an opening for the reception of material and the lower end having a discharge opening, the wall of the drum having a plurality of openings, a screening device located within the drum and secured to the latter so as to be rotatable therewith, the screening device having a frusto-conical screen section and a tubular discharge section, the upper end of the screen section being attached to the drum between the intake opening and discharge opening, and the lower end of the screen section being connected to the upper end of the tubular discharge section, the wall of the screen section having a plurality of openings, which are elongated in the general direction of the axis of rotation and whose leading edges are farther removed from the center of rotation than the following edges whereby a cleaning action is produced as the drum is rotated.

7. A rotary screening device comprising, a substantially cylindrical drum rotatable about its central axis, one end of the drum having an intake opening for the reception of material comprising placer gravel and water and the other end having a discharge opening, a substantially cylindrical screen located within the drum in concentric relation thereto, one end of the screen being in communication with the intake opening, the other end of the screen having a central discharge opening of smaller diameter than the interior of the drum, the wall of the screen having elongated openings extending in the direction of the axis of rotation, the material on opposite sides of the openings being offset in such a way that the edge on the advancing side is farther from the center of rotation than the opposite edge whereby when the screen is rotated, the movement of the material will effect a cleaning action.

8. A rotary screen comprising, a substantially cylindrical drum mounted for axial rotation, one end of the drum having an intake opening through which material comprising placer gravel and water is introduced and the other end having a discharge opening of less diameter than the drum, the wall of the drum having a plurality of elongated openings extending in the direction of the axis, the material on opposite sides of the openings being offset in such a way that the advancing edge is farther from the center of rotation than the following edge whereby a cleaning action is obtained when the screen is in operation.

9. A device for screening and concentrating wet placer gravel or the like, comprising, in combination, a supporting frame, a cylindrical drum carried by the frame and mounted for rotation about its central axis which is preferably inclined with respect to a horizontal plane, means for rotating the drum, means for introducing placer gravel and water into the upper end of the drum,

a cylindrical screen located in the drum and held in concentric relation therewith, the upper end of the screen being attached to the inside of the drum whereby the material fed into the upper end thereof will also enter the upper end of the screen, the wall of the screen having openings which are elongated in the general direction of the axis of rotation and in which the material forming the edge of each opening, which points in the direction of rotation, being farther from the center of rotation than the opposite edge whereby the material is directed away from the openings during operation, and which results in a cleaning action.

10. A device for screening and concentrating wet placer gravel or the like comprising, in combination, a supporting frame, a cylindrical drum carried by the frame and mounted for rotation about its central axis which is preferably inclined with respect to a horizontal plane, means for rotating the drum, means for introducing placer gravel and water into the upper end of the drum, the lower end of the drum having a section provided with openings forming a screening device, a cylindrical screen located in the drum and held in concentric relation therewith, the upper end of the screen being attached to the inside of the drum whereby the material fed into the upper end thereof will also enter the upper end of the screen, the wall of the screen having openings which are elongated in the general direction of the axis of rotation and in which the material forming the edge of each opening, which points in the direction of rotation, being farther from the center of rotation than the opposite edge, whereby the material is directed away from the openings during operation and which results in a cleaning action.

11. A rotary screening device comprising, a substantially cylindrical drum rotatable about its central axis, one end of the drum having an intake opening for the reception of material comprising, a placer, gravel and water, the other end having a discharge opening, a substantially cylindrical screen located within the drum in concentric relation thereto, one end of the screen being in communication with the intake opening, the other end of the screen having a discharge opening, the wall of the screen having elongated openings extending in the direction of the axis of rotation, the material on opposite sides of the openings being offset in such a way that the edge on the advancing side is farther away from the center of rotation than the opposite edge whereby the material is directed away from the openings during operation, and which results in a cleaning action.

12. A rotary screen comprising a substantially cylindrical drum mounted for axial rotation, one end of the drum having an intake opening through which material, comprising placer gravel and water is introduced, the other end having a discharge opening, the wall of the drum having a plurality of elongated openings extending in the general direction of the axis, the material on opposite sides of the openings being offset in such a way that the advancing edge is farther from the center of rotation than the following edge whereby a cleaning action is obtained when the screen is in operation.

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