March 8, 1932. H. S. BENNETT ET AL 1,848,151

PROCESS AND APPARATUS FOR DRY ORE SEPARATION

Filed Jan. 30, 1929 2 Sheets-Sheet 1

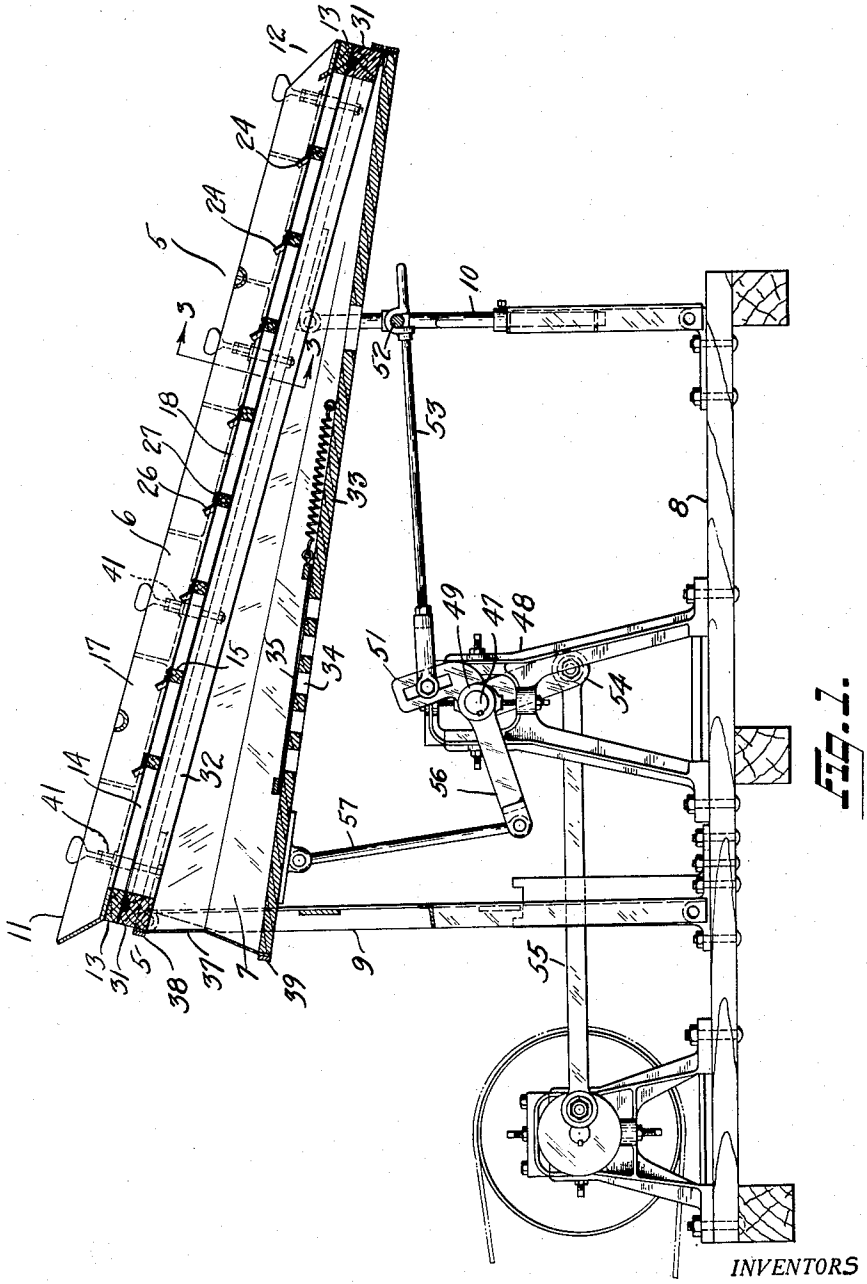


Fig. 1.

INVENTORS
HARVEY S. BENNETT.
BY A. J. SCHMEDESKAMP
Joseph B. Gardner
ATTORNEY.

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PROCESS AND APPARATUS FOR DRY ORE SEPARATION

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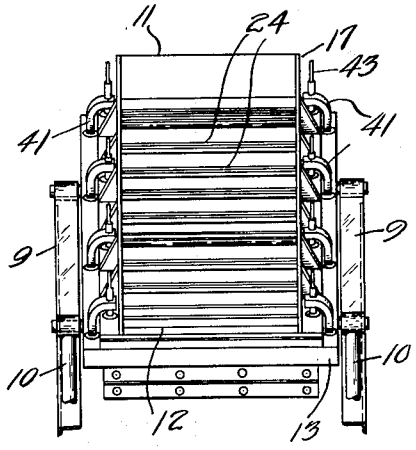


Fig. 2.

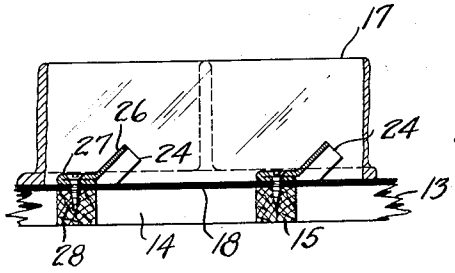


Fig. 4.

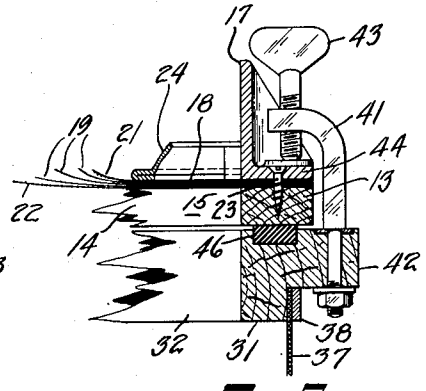


Fig. 3.

INVENTOR.
HARVEY S. BENNETT.
BY A. J. SCHMIEDESKAMP
Joseph B. Gardner
ATTORNEY.

Patented Mar. 8, 1932 1,848,151

UNITED STATES PATENT OFFICE

HARVEY S. BENNETT AND AUGUST J. SCHMIEDESKAMP, OF BERKELEY, CALIFORNIA, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO ART TAYLOR, THIRTY ONE-HUNDREDTHS TO H. D. TURNER, AND ONE-FIFTH TO SAID HARVEY S. BENNETT, ALL OF OAKLAND, CALIFORNIA

PROCESS AND APPARATUS FOR DRY ORE SEPARATION

Application filed January 30, 1929. Serial No. 336,180.

The invention relates to a process and apparatus for effecting a separation or concentration of values from placer gravels, and the like, and relates more particularly to the type of apparatus and process wherein the separation or concentration is arranged to be effected without the use of water.

Of the various machines utilizing the so-called "dry washing" principle of separating the values from placer gravel and the like, the most successful are the type in which the material is treated and advanced on a riffled reciprocating surface while subjected at predetermined periods in the movement of the surface to an upward blast of air. In the usual arrangement the treating surface is inclined so that in the reciprocation thereof the material is caused during the retracting stroke to move against and over the riffles toward the lower or discharge end of said surface, while during the forward stroke the material is caused to spread itself between the successive riffles. In accordance with the theory heretofore prevailing, it was deemed best to subject the material to the action of the blast while the material was thrown into the air, such as when it was being forced over the riffles during the retraction stroke. To be sure, the material thus in suspension is in condition to effectively receive the full benefit of the blast, but owing to the fact that most of the material banks and tightly packs against the riffles during such stroke, by far the greater portion of the material will be too closely associated to allow of the effective penetration of the blast. In accordance, however, with my invention, the material is arranged to be subjected to the blast practically entirely and exclusively throughout the forward stroke of the treating surface, it being noted during such stroke, as above mentioned, the material is caused to spread over the surface, and to assume a loose, flaky condition. It will thus be clear that the blast may effectively act on all the material on the treating surface during a complete stroke thereof.

In view of the above it will be seen that it is one of the objects of my invention to provide a process and apparatus of the character described by which a maximum amount of material may be effectively treated with a given size of machine.

Another object of the invention is to provide a machine of the character described in which the riffles will be so formed and positioned that the packing or wedging of the material thereagainst during the advancing stroke of the treating surface will be prevented without at the same time impairing the effectiveness of the riffles relative to their separating function.

The invenion possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a vertical sectional view of the machine of my invention.

Figure 2 is an end view of the material treating portion of the machine viewed from the discharge end thereof.

Figure 3 is an enlarged transverse sectional detail of a portion of the members forming the treating surface and furnishing the blast.

Figure 4 is an enlarged longitudinal sectional detail of the member forming the treating surface.

In the preferred embodiment of the invention, as illustrated in the drawings, the machine comprises what may be termed a treating unit 5 made up of tray member 6 and a bellows member 7. The unit 5 is supported in spaced relation over a bed frame 8 by means of pairs of links 9 and 10 which are connected to the frame and unit, the links 9 being disposed at the feed end 11 of the unit while the links 10 are located adjacent the discharge end 12. As will be clear from Figure 1, the tray member slopes downwardly from the feed to the discharge end thereof, and comprises a frame 13 here

shown of rectangular form and having a central opening 14 therein across which are provided transverse panels 15. Arranged on the frame and extending upwardly therefrom is a member 17 which defines the sides of the tray and is arranged to confine the material therein, it being noted, however, that the member is open at the lower end of the tray so that the material may readily discharge therefrom. Preferably interposed between the member and the frame 13, and covering the opening 14, is the tray bottom 18 which is composed of a plurality of cloth layers 19 arranged between screens 21 and 22 respectively disposed on the top and bottom of the layers. The cloth layers are preferably of linen, silk and what is known as bushing cloth, and of such character as to render the tray bottom impervious to the material treated, but pervious to air. The screens 21 and 22 are preferably of metal such as phosphorous bronze and are arranged to form with the cloth layers a relatively inflexible or rigid bottom. Extending transversely across the bottom 18 and positioned over the panels 15 are riffle bars 24 having an upstanding portion 26 and an attaching portion 27 which is secured to the panels by means of screws 28. The portions 26 of the riffles are inclined upwardly toward the feed end of the trough, that is, in a direction contrary to the flow of the material over the tray. Preferably the angle of inclination of the riffle portions 26 with respect to the bottom of the tray is about 45 degrees. Attachment of the member 17, bottom 18, and frame 13, is effected through means of screws 23, as clearly shown in Figure 3, so that the parts comprising the tray member 5 form a unitary section of the machine.

The bellows 7 as heretofore explained is structurally associated with the tray member 5 and comprises a frame 31 of substantially the same shape but larger than the tray frame 13. An opening 32 in the frame is coincident with the opening 14 of the tray frame and forms the discharge for the bellows. Hinged to the frame 31, preferably adjacent the discharge end of the machine, is the suction side wall 33 of the bellows which, as shown in Figure 1, is provided with air inlet openings 34 engaged by a valve 35. The dilating walls 37 of the bellows may be formed of leather or the like, in the usual manner, and are secured to the respective frames 31 and 33 by means of bands 38 and 39.

The tray member 5 is arranged for detachable connection to the bellows so that the former may be readily removed or replaced when necessary, such as when the concentrate is to be removed therefrom. To this end, clamps 41 are rotatably secured to extensions 42 of the bellows frame and are provided with hand screws 43 which bear against angular base portions 44 of the tray sides 17 to draw and hold the frames together. Release of the tray member may be effected by retracting the screw and turning the clamp outwardly. Preferably a resilient gasket 46 is interposed between the frames so that when the latter are clamped together a sealed joint will be maintained between them.

As previously stated, the tray member is arranged to be reciprocated in a direction substantially longitudinally thereof, and as here shown such motion is effected by rocking the links 9 and 10, whose upper ends are connected to the frame 31. Mounted on a rocker shaft 47 disposed in a bearing member 48 is a lever 49 having an arm 51 which is adjustably and operatively attached to a cross bar 52 of the links 10 by means of a connecting rod 53. Oscillation of the shaft may be effected through the medium of a pitman 55 which is connected to the shaft by means of a crank 54 and is driven through suitable driving connections from any available source of power.

It may be noted that the links 10 are adjustable so that the angle of slope of the tray may be readily varied as desired, and the driving means above described is so constructed that adjustment in the movement of the tray may be effected without impairing the desired movement of the bellows.

Dilation of the bellows may be effected through the medium of the shaft 47. As here shown, the side wall 33 of the bellows is connected to an arm 56 of the lever 49 by means of a link 57 so that the bellows will be expanded and contracted during each complete reciprocation of the treating unit. It will be noted that the dilation of the bellows is so related to the reciprocative movement of the unit, that the contraction of the latter and the consequent forcing of air through the tray bottom will occur during the retraction stroke of the unit, that is, the stroke in which the unit moved in the direction contrary to the flow of the material thereover.

In the operation of the machine, the material to be treated is deposited at the upper end of the tray from whence it is caused to advance toward the discharge or lower end of the tray due to the slope thereof and the reciprocative movement partaken thereby. As will be understood the advance of the material on and with respect to the tray will be effected during the retracting stroke of the latter, since the material tends to continue in the forward movement partaken by it while resting on the tray during the advance stroke. It will further be understood, as previously explained, that during the retraction stroke of the tray the lighter material will move over the riffles while the heavier will pack thereagainst in a comparatively solid mass. On the other hand, during the forward stroke of the tray, the material will back away from

the riffles and distribute itself evenly and loosely in the spaces between the riffles, and it is while the material is in this condition that the blast of air will be forced upwardly through the tray and bottom, with the resulting effectiveness previously referred to. It is to be noted that due to the peculiar inclination of the riffles not only will the values be readily trapped thereby during the advance stroke of the tray, but any packing or massing of the material thereagainst during the retraction stroke will be prevented. It will thus be seen that by utilizing a blast of air during the retraction stroke of the tray, the inclination of the riffle in our machine is taken advantage of for obtaining a new result.

While it is not absolutely necessary that the blast of air be entirely confined to the forward stroke of the tray, or that the blast continue during the entire period of such stroke, efficient results require that at least the major force of the blast occur during said stroke. In other words, under ordinary conditions of operation the requisite is that the mean air pressure against the material during the advance stroke should exceed the mean air pressure against the material during the retraction stroke.

We claim:

1. In a machine for separating precious metals from placer gravel and the like, an inclined foraminated tray having riffles extending transversely thereacross, means to oscillate the tray substantially longitudinally thereof, and means to force a current of air upwardly through the tray exclusively during the oscillatory movement thereof toward the lower end.

2. In a machine for separating precious metals from placer gravels and the like, longitudinally-sloping foraminated tray arranged to receive materials at the upper end for advancement thereon toward the lower end, riffle plates extending transversely across the tray and being inclined upwardly toward the feed end of the tray so as to form an angle of substantially 45 degrees with the bottom thereof, means to reciprocate the tray substantially rectilinearly thereof, and means to blow a blast of air upwardly through the tray during the advance movement of the tray.

3. In a machine for separating precious metals from placer gravels and the like, a tray having a bottom, pervious to air and impervious to the material being treated; riffles on the tray bottom and being inclined in a direction contrary to the flow of material over the tray; means to reciprocate the tray substantially rectilinearly thereof; and means operating only on forward movement of said tray to force a draft of air upwardly through the tray bottom.

4. In a machine of the character described, a tray having a bottom pervious to air and impervious to the material to be treated, riffle plates extending transversely over the tray bottom and being inclined in a direction contrary to the flow of the material over the tray, means to reciprocate the tray substantially rectilinearly thereof, and means to force a draft of air upwardly through the tray bottom exclusively during the advance movement of the tray.

5. A process for separating precious metals from gravel and the like on a movable support which comprises retracting the support to cause an advancement and packing of the material thereon, then advancing the support to cause a loosening and spreading of the material and simultaneously subjecting the material to an upward blast of air, and then retracting the support and discontinuing the blast of air during substantially the entire retracting movement.

6. A process for separating precious metals from gravel and the like, which comprises imparting a motion to the material to cause it to advance and pack, then imparting a motion to the material to cause it to loosen and spread and simultaneously subjecting the material to a blast of air, and interrupting the blast substantially when the last mentioned motion is discontinued.

In testimony whereof, we have hereunto set our hands at Oakland, California, this 25th day of January, 1929.

HARVEY S. BENNETT.
AUGUST J. SCHMIEDESKAMP.