July 22, 1947. J. M. NICOL 2,424,367

RECIPROCATING AND ROTATING DRUM CONCENTRATOR

Filed March 5, 1945 2 Sheets-Sheet 1

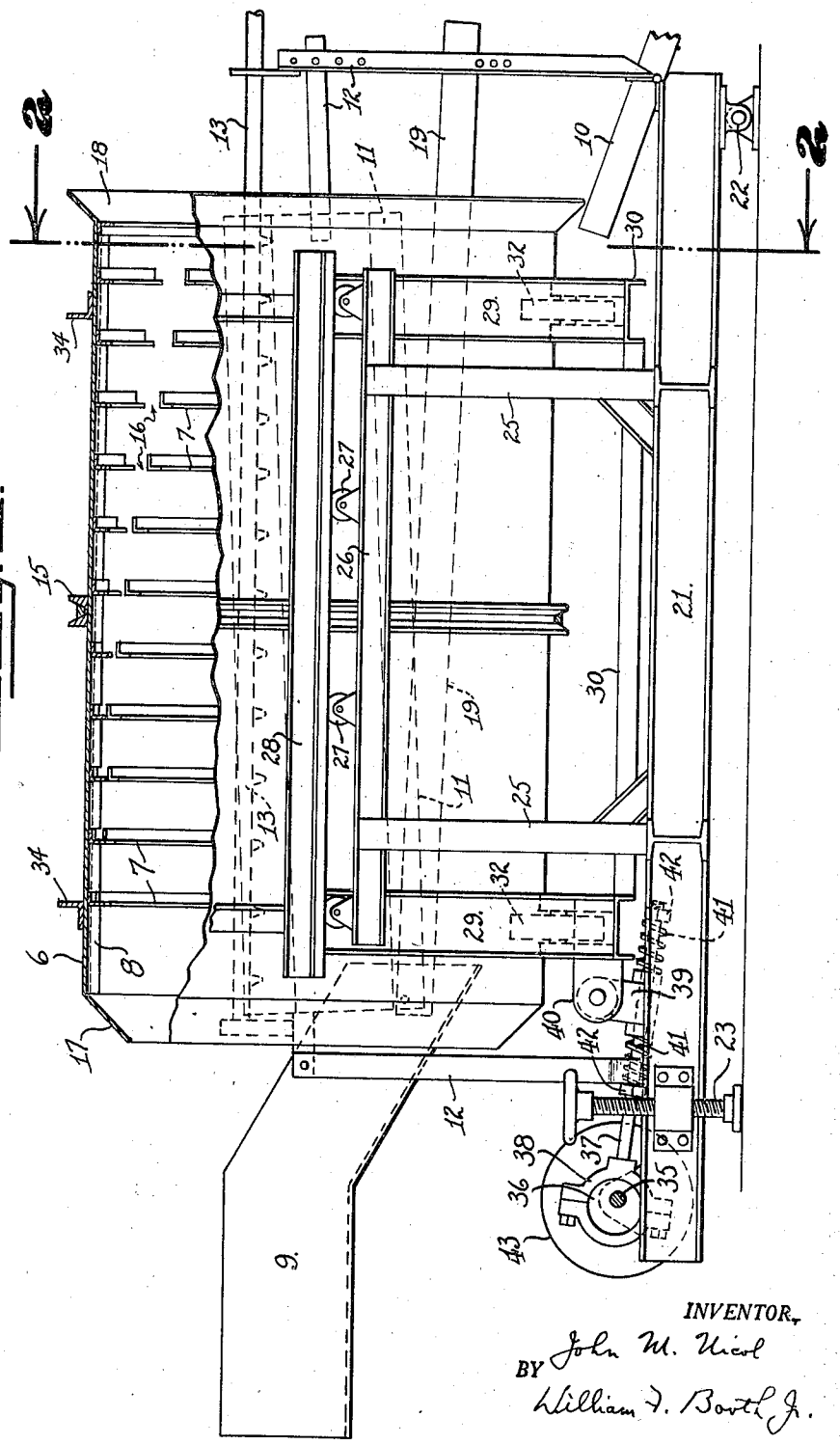


Fig. 1.

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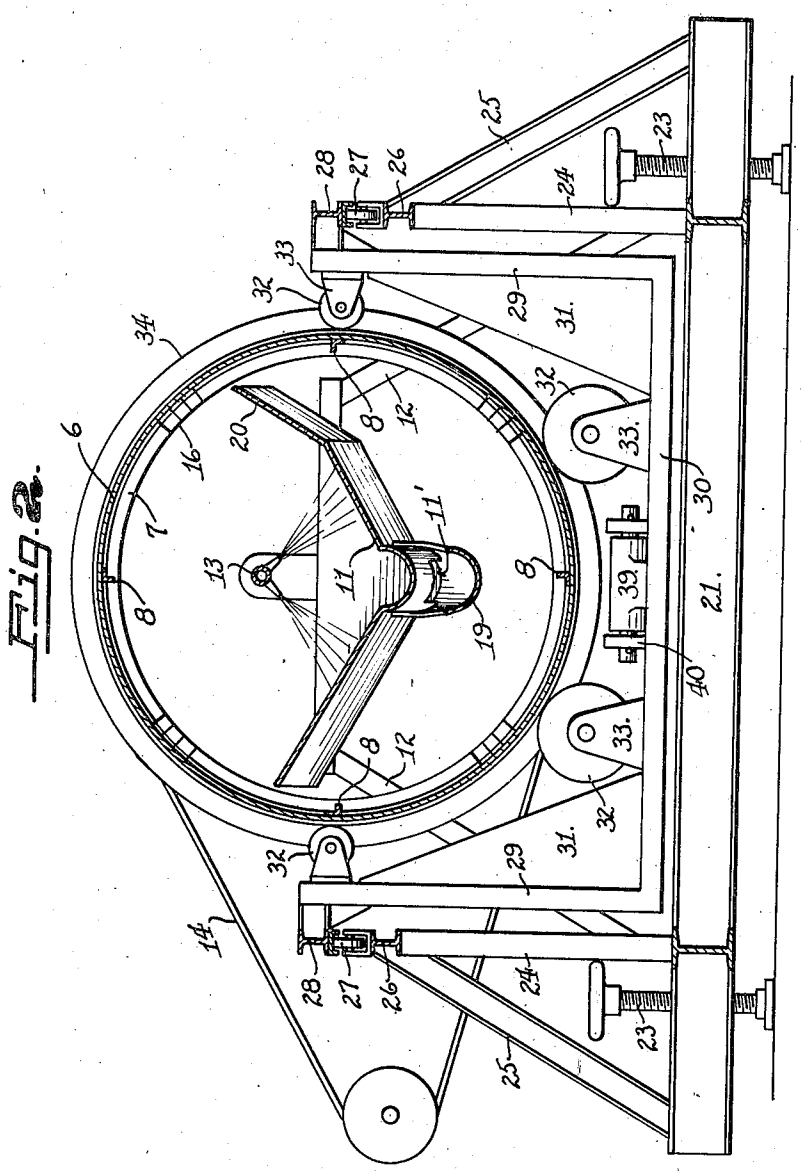


Fig. 2.

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RECIPROCATING AND ROTATING DRUM CONCENTRATOR

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Application March 5, 1945, Serial No. 581,028

4 Claims. (Cl. 209—452)

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The present invention relates to ore classifiers, and constitutes an improvement upon the machine for which United States Letters Patent No. 2,053,802 were granted to me September 8, 1936.

The principal objects of the invention, in general, are the same as those stated in my said prior patent, viz: to provide a machine for continuously separating heavier particles from lighter particles in a stream of unclassified metal or mineral bearing material, such for example as gold or tin bearing gravels from placer deposits.

Specific objects of the present improvements are to provide more rapid and complete classification, and more positive and effective advance movement of the stream of material, than was possible in the machine of my said prior patent, these objects being achieved by a novel means for mounting the drum whereby it has a longitudinal jigging motion while rotating. Other objects and advantages of the present invention will be apparent from the following specification, which should be read with the understanding that changes, within the scope of the claims hereto appended, may be made in the form, construction and arrangement of the several parts, without departing from the spirit of the invention.

Reference will be made to the accompanying drawings, wherein:

Fig. 1 is a side elevation, partly broken away, of my complete machine.

Fig. 2 is a transverse section on the line 2—2 of Fig. 1.

The drum of my present concentrator is essentially similar to that described in my said prior patent, and comprises a cylindrical shell 6 having interior circumferential cross riffles 7 and longitudinal lifters 8 of less height than said cross riffles. A feed chute 9 conveys unclassified material into one end of the drum, and a discharge chute 10 receives the waste material from the other end. A launder 11, supported by brackets 12, is positioned within the drum to receive the concentrate picked up by the lifters 8. Water is introduced into the drum through a pipe 13, and discharged therefrom against the launder 11 and the lifters 8. The drum is rotated, at slow speed, preferably not more than two revolutions per minute, by any suitable means such as a V belt 14 running in a grooved ring 15 secured to the outside of the drum. The drive mechanism (not shown) should provide for adjustment in the speed of the drum, to suit different types of material.

Each riffle 7 is provided with a gap 16, so that

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boulders and irregular shaped rocks and other objects can pass through them, and the gaps of successive cross riffles are staggered, to form a spiral escape path for such irregular objects to prevent packing of the riffles. Up to this point, the present machine is similar to that of my said prior patent.

In my proved machine, the drum is provided with an inwardly inclined flange 17 at its inlet end and an outwardly inclined or flared flange 18 at its discharge end, so that the material will pass through it even when its axis is level. However, the mounting for the drum, to be described later, provides means for adjustably tilting its axis to suit the particular material being run.

The launder 11 comprises a shallow pan positioned at or slightly above the center of the drum, and having its bottom sloping down to a discharge opening 11' near its forward end, i. e., near the inlet end of the drum. A trough 19 leads from said opening beneath the pan and out through the discharge end of the drum. The edge of the pan 11 on the side at which the drum is rising is positioned as close as possible to the cross riffles 7, and the opposite side of the pan has an upwardly inclined apron 20, also close to the cross riffles. The pan therefore catches all or almost all of the concentrates from the lifters 8. I have found that a small number of lifters are effective, and have shown four in the drawing, equally spaced around the drum. The interior of the drum, between the cross riffles 7 and lifters 8, may be provided if desired with a suitable wear resisting lining, not shown, such as rubber or other similar material.

My improved mounting for the rotating drum comprises a base frame 21, one end of which is supported by a hinge 22 and the other end by screws 23, whereby it may be tilted to adjust the inclination of the drum axis. The frame 21 has uprights 24 at its sides, braced by inclined pieces 25, and said uprights support horizontal rails 26 upon which are mounted rollers 27. A cradle is suspended between the sides of the base frame, and comprises horizontal rails 28 which rest upon the rollers 27, vertical suspension members 29, horizontal bottom members 30, and bracing gussets 31, all rigidly connected together by welding or riveting. Rollers 32 are mounted in journal brackets 33 inside the cradle, at its bottom and sides, and the drum rests and revolves upon and between said rollers. Flanges 34 on the drum serve as guides to prevent its endwise movement on the supporting rollers 33.

A transverse shaft 35 is mounted in suitable

bearings at one end of the base, and carries an eccentric 36. A rod 37 connects the strap 38 of said eccentric with the adjacent end of the cradle, so that as the eccentric revolves, the cradle and the drum are given a longitudinal reciprocating or jigging motion. The throw of the eccentric is preferably about one inch. The rod 37 is connected to the cradle by an adjustable cushioned coupling comprising a trunnion block 39 pivotally mounted in a bracket 40 secured to the end of the cradle. The rod 37 slides freely through the trunnion block, and has a spring 41 at each end, compressed between said block and adjustable nuts 42. By adjusting said nuts, the range of movement of the cradle can be varied, as well as the cushioning effect of the springs.

The shaft 35 is rotated by any suitable means, such as a belt, not shown, passing over a pulley 43 on said shaft. The driving means should provide for variable speed, so that the optimum rate of vibration or jigging of the cradle and drum can be obtained.

In the operation of my concentrator, the unclassified material is fed into the drum from the chute 9 with sufficient water to produce the necessary boil and to wash the coarser and lighter waste material over the cross riffles 7 and out into the discharge chute 10. The fines, in which the values are concentrated, settle to the bottom between the cross riffles and are elevated by the lifters 8 and dumped into the launder 11. Suitable jets of water issuing from orifices in the spray pipe 13, assist in removing the fines from the lifters 8 and in washing them from the launder into the discharge trough 19.

The action of the rotating drum with its internal cross riffles and longitudinal lifters is somewhat similar to that of the ordinary stationary sluice box, except that the fines are continuously removed from the riffles, and therefore there is no packing and clogging of the riffles, which would permit an increasing amount of fines to pass over and be lost. The longitudinal jigging motion of the drum, which is an essential novel feature of the present invention, keeps the mass of material agitated, assists and accelerates the settling of the heavy fines so that they are more surely caught by the riffles and removed by the lifters, and accelerates the movement of the coarser waste through the drum.

The gaps 16 in the cross riffles, arranged in a helical path from the intake to the discharge ends of the drum, provide an escape way for boulders and larger irregular pieces of rock that might otherwise, on account of their size and shape, fail to pass over the riffles and consequently clog the same and cause the fines to pack.

By having the jigging cradle mounted on elevated rails at about the height of the axis of the drum, which is above its center of gravity when loaded, and by providing the supporting rollers 32 high up on the sides of the drum as well as at its bottom, I minimize the tendency of the drum and the cradle to jump off their respective supporting rollers during their reciprocating movement.

I claim:

1. A drum concentrator comprising a movable drum having its axis approximately horizontal, means for rotating said drum about its axis, means for introducing unclassified material into one end of said drum, means for advancing said material through said drum and discharging the coarser portions thereof from the other end, spaced transverse riffles secured to the inner surface of the drum, longitudinally disposed lifters of less height than said riffles extending between them, a launder within the drum positioned to receive the finer portions of said material from said lifters, said launder sloping downwardly toward the intake end of the drum and having a discharge aperture at its lowest point, a discharge pipe extending from said aperture beneath the launder and out through the discharge end of the drum, and means for reciprocating said drum longitudinally to assist the separation of the fines from the coarser material.

2. A drum concentrator comprising a movable drum having its axis approximately horizontal, means for rotating said drum about its axis, means for introducing unclassified material into one end of said drum, means for advancing said material through said drum and discharging the coarser portions thereof from the other end, spaced transverse riffles secured to the inner surface of the drum, longitudinally disposed lifters of less height than said riffles extending between them, a launder within the drum positioned to receive the finer portions of said material from said lifters, a frame having spaced side members rising to the approximate level of the center of the drum, a movable cradle positioned between said frame side members, said cradle having a bottom and side members, the upper portions of said cradle side members being movably connected with said frame side members whereby said cradle is suspended between the sides of said frame, rollers mounted on the bottom and sides of said cradle for rotatably supporting said drum, and means for reciprocating said cradle longitudinally of the axis of the drum to assist the separation of the fines from the coarser material in said drum.

3. A drum concentrator comprising a movable drum having its axis approximately horizontal, means for rotating said drum about its axis, means for introducing unclassified material into one end of said drum, means for advancing said material through said drum and discharging the coarser portions thereof from the other end, spaced transverse riffles secured to the inner surface of the drum, longitudinally disposed lifters of less height than said riffles extending between them, a launder within the drum positioned to receive the finer portions of said material from said lifters, a cradle within which said drum is rotatably mounted, said cradle having a bottom beneath said drum and side members rising on each side thereof to the approximate level of the center of said drum, a frame upon which said cradle is movably supported, said frame having side members positioned outside the cradle side members, the upper portions of said cradle side members overlying the upper portions of said frame side members, rollers interposed between the side members of said cradle and said frame, whereby said cradle is suspended from the frame side members, and means for reciprocating said cradle longitudinally of the axis of the drum to assist the separation of the fines from the coarser material in said drum.

4. A drum concentrator comprising a movable drum having its axis approximately horizontal, said drum having a feed aperture bounded by an inwardly inclined flange at one end and a discharge aperture at the other end larger than said feed aperture, means for rotating said drum, means for introducing unclassified material into the feed end of said drum, means for advancing said material through said drum and discharging

the coarser portions thereof from the other end, spaced transverse riffles secured to the inner surface of the drum, longitudinally disposed lifters of less height than said riffles extending between them, a launder within the drum positioned to receive the finer portions of said material from said lifters, a cradle within which said drum is rotatably mounted, said cradle having a bottom beneath said drum and side members rising on each side thereof to the approximate level of the center of said drum, a frame upon which said cradle is movably supported, said frame having side members positioned outside the cradle side members, the upper portions of said cradle side members overlying the upper portions of said frame side members, rollers interposed between the side members of said cradle and said frame, whereby said cradle is suspended from the frame side members, and means for reciprocating said

cradle longitudinally of the axis of the drum to assist the separation of the fines from the coarser material in said drum.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,053,802	Nocol	Sept. 8, 1936
287,840	Malry	Nov. 6, 1883
299,337	Brotherhood	May 27, 1884

FOREIGN PATENTS

Number	Country	Date
472,997	France	Sept. 1, 1914
1,151	Great Britain	1909