Jan. 20, 1931. G. C. CRANGLE 1,789,516

PULSATOR AND THE LIKE

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Fig. 1.

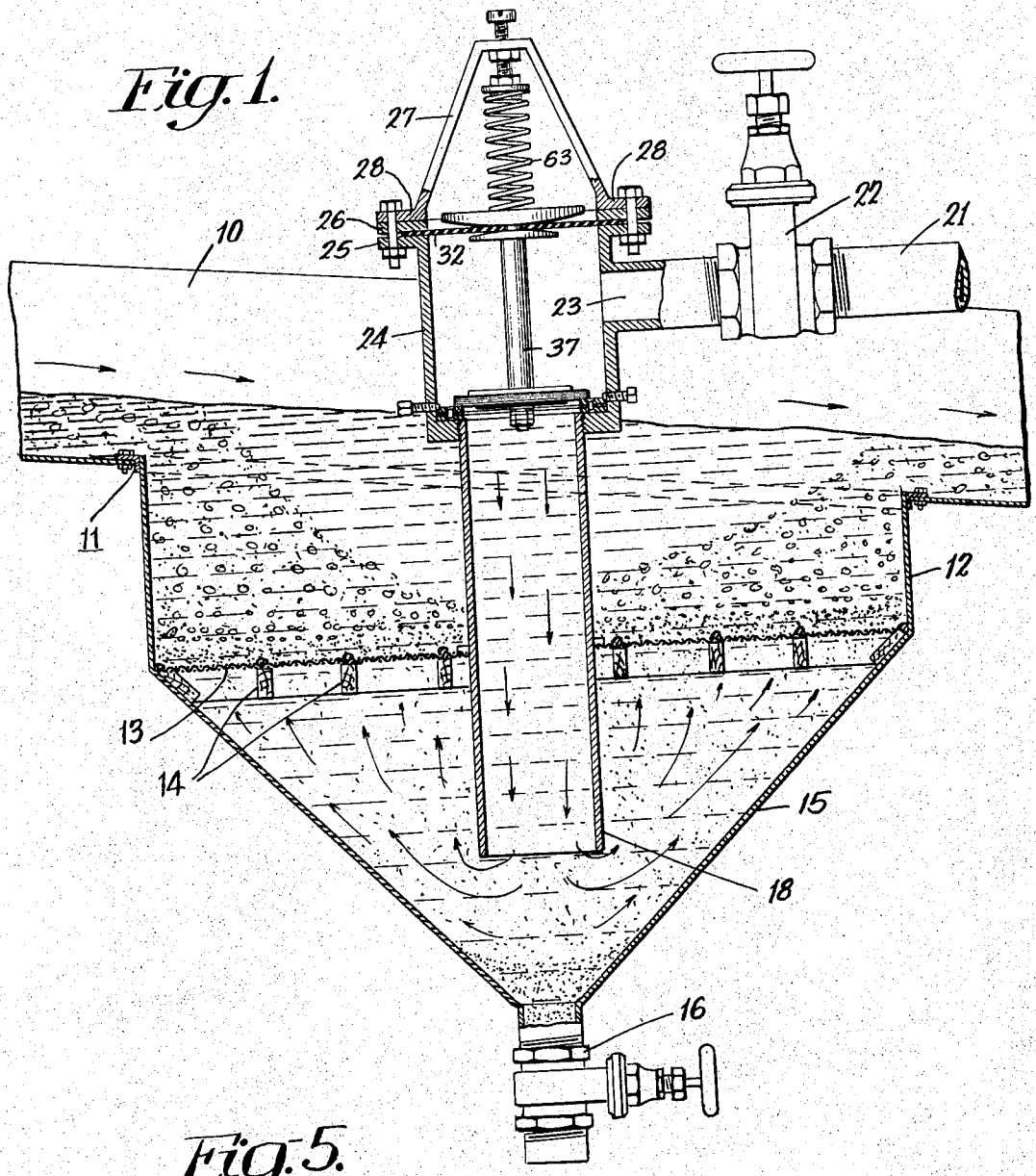
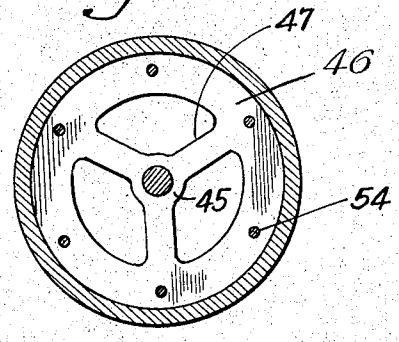


Fig. 5.



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Fig. 2,

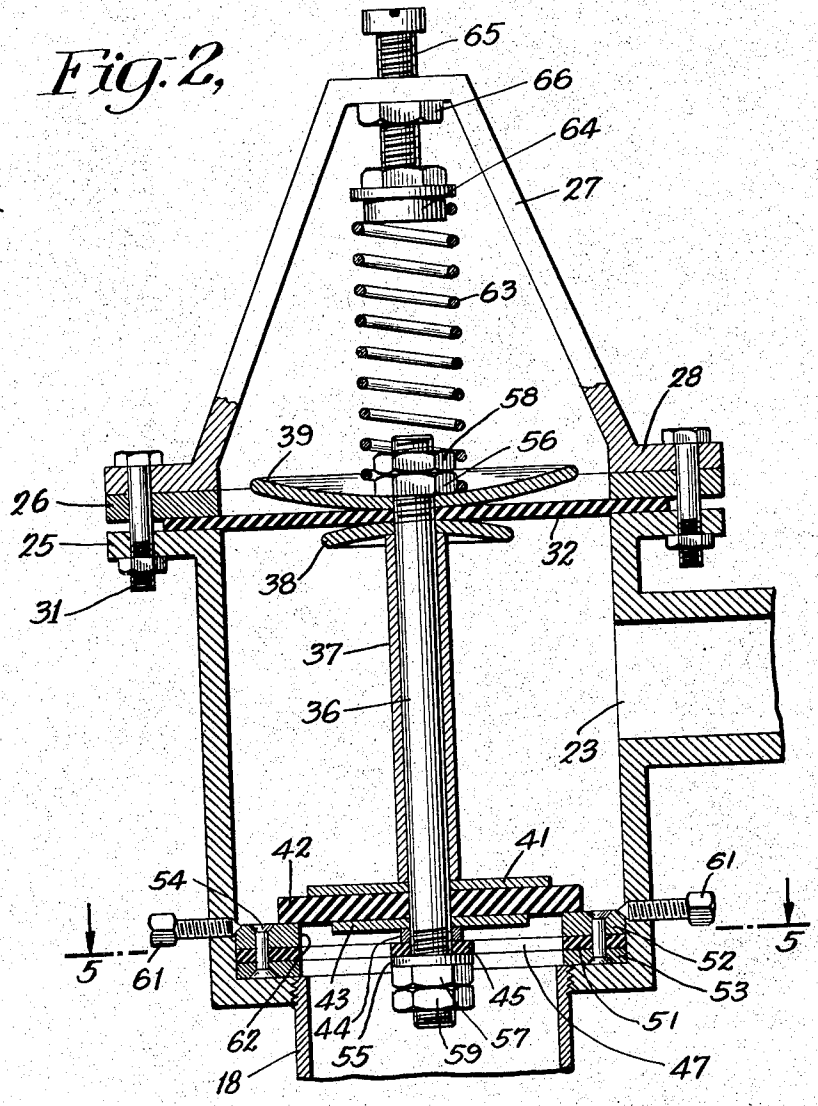


Fig. 3,

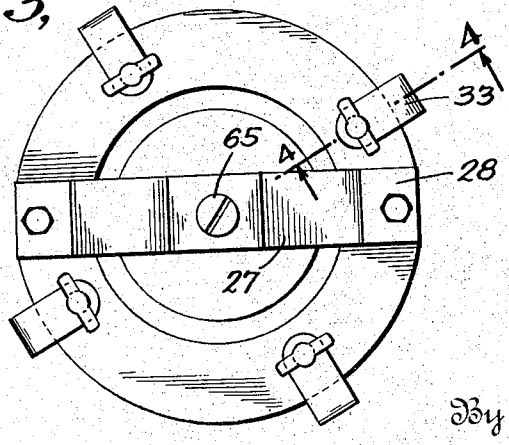
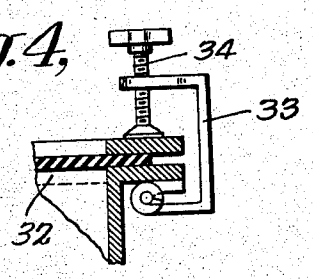


Fig. 4,



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UNITED STATES PATENT OFFICE

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PULSATOR AND THE LIKE

Application filed September 21, 1927. Serial No. 220,867.

This invention relates generally to pulsators and the like. One of its objects is to provide a mechanism which can be used as a pulsator under widely varying conditions for a number of different purposes such as washing, classifying or agitating coal, ores and other kinds of material, although the mechanism is not limited to such uses.

In the following specification and in the drawings accompanying it, the invention is disclosed in one form which it might have when embodied in what may be termed a hydraulic pulsating jig. This disclosure is, however, intended mainly to afford a convenient way of explaining the various ideas involved. As will be clear later, the ideas referred to are capable of embodiment in various forms, and the apparatus may be used as a whole or in part for a number of different purposes in addition to the ones above mentioned, in fact, as will also be clear later, a part of the mechanism may be used to give movement to other mechanism instead of imparting a pulsating movement to material being washed or otherwise treated.

Another object of the invention is to provide a mechanism which has the general characteristics previously mentioned and which can be built at a minimum cost.

Other objects are to provide a mechanism which will not require much power for its operation, which has extreme flexibility of adjustment to control its operations, which has no belting and belt-driven parts requiring lubrication, which has no bearings requiring protection from sand or grit and constant oiling, and which is so sturdy and trouble-proof as to require substantially no repair or other attention over a long period of time. All of these things are highly desirable, and particularly so when the apparatus is used in sections where supplies and repair parts may not be easily available.

With the foregoing and other objects in view, the invention consists in a novel construction and arrangement of parts, the novel features of which are pointed out in the claims hereof, and an illustrative embodiment of which is shown in the drawing accompanying and forming a part of this specification.

In said drawings,

Fig. 1 shows the various ideas embodied in an apparatus suitable for separating mineral from sand, gravel, and the like.

Fig. 2 is a detail in section and on a larger scale, of a part of the apparatus shown in Fig. 1.

Fig. 3 is a top plan view of the apparatus shown in Fig. 2, but shows a different form of devices for fastening some of the parts together.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is a detail of a flexible guide or support for one of the moving parts of the mechanism of Figs. 1 and 2.

The apparatus in the drawings is designed primarily for use in connection with gold or platinum dredging operations and the like, and comprises one or more troughs or sluices 10 for water-borne material. Each of the sluices is cut away to form an opening, 11. Fastened to the sluice under the opening is a hopper 12 having its top in substantially the same plane as the bottom of the sluice.

Extending across the hopper 12 is a screen 13 which may be of any mesh suitable for the purpose intended. The screen is preferably on a horizontal plane and is supported by cross members 14 fastened to the casing. The arrangement is such that as the material flowing in the sluice passes over the screen the heavier portions of it will be caught above the screen and the finer particles of mineral may drop through the screen and be delivered by the converging sides 15 of a hutch to a trap 16 of any suitable construction through which they can subsequently be removed.

It is apparent that instead of the current flowing across the top of the hopper the material might be delivered by a launder terminating at the hopper 12 or that for handling certain materials the delivery might be made in separate batches for separation instead of being delivered by a continuously flowing current.

In order for such an apparatus to be efficient, it is necessary to prevent the material to be separated from packing together above the screen to such an extent as to interfere with classifying and screening operations. For this purpose, it is desirable to shake up or agitate the material above the screen. This is preferably done by giving a pulsating movement to or through the material above the screen. The hutch 15 below the screen will, of course, be filled with water coming from the sluice 10, and this water might be agitated or given a pulsating movement. It is preferred, however, to introduce a pulsating current of water of considerable volume under the screen and cause it to pass upward through the screen and the material thereon.

In the apparatus illustrated in the drawings, this pulsating current is introduced through a conduit or pipe 18 extending vertically through the screen. This location of the conduit 18 is, however, merely a convenient one and it might be introduced through the bottom or sides of the hutch without materially affecting the operation.

The water for supplying the current through the conduit 18 is delivered under the required pressure or head through a pipe 21 and valve 22 to an inlet 23 in a cylindrical casing 24 secured to the upper end of the conduit 18. The casing 24 has a flange 25 at its upper end, and above the flange is a ring 26. Resting upon the ring 26 is a bracket 27 which, for reasons explained later, may not always be used. The bracket 27 has extrusions or lugs 28 provided with holes to receive two of a plurality of bolts 31 which may be used to draw the ring 26 toward the upper face of the flange 25. Clamped between the ring 26 and the flange is a flexible diaphragm 32 referred to more in detail later on.

Instead of using the bolts 31 a more convenient arrangement such as shown in Figs. 4 and 5 may be used. That arrangement comprises a set of clamps 33, which may be pivoted to the under side of the flange 25, and each of which is provided with a clamping bolt 34 for forcing the ring 26 toward the flange 25.

The diaphragm 32 is preferably formed of elastic sheet rubber of a good quality and is perforated at its center to receive a rod 36. Surrounding the rod 36 is a sleeve 37, Fig. 2, and between the upper end of the sleeve and the diaphragm 32 is a cupped disk 38. Above the diaphragm 32 is a cupped disk 39. The disk 39 is larger than the disk 38 and both of them are so placed that their convex faces contact the diaphragm.

At its lower end the rod 36 carries a washer 41, a valve member 42 of rubber or leather, and washers 43 and 44, the latter washer engaging what may be termed the hub 45 (Figs. 2 and 5) of a flexible guide member 46, the hub 45 having an opening or perforation to receive the rod 36. The guide member 46 is, like the diaphragm 32, made from a flexible material such as sheet rubber and is cut away to form arms or straps 47 which preferably merge at their outer ends with a circular portion 51. The ends of the straps, or the circular portion 51, are clamped between two rings 52 and 53 held together by rivets or screws 54. A washer 55 (Fig. 2) engages the under side of the member 46.

The upper and lower ends of the rod 36 are threaded to cooperate with nuts 56 and 57 and lock nuts 58 and 59. When the nuts in question are properly tightened all of the washers and other elements between them will be clamped or drawn together to form substantially a unit with the rod 36.

The upper face of the ring 52 serves as a valve seat for the valve member 42, and the ring 53, to which the ring 52 is secured, rests upon an inner flange of the casing 24. The upper and outer edge of the ring 52 is beveled or chamfered to cooperate with set screws 61 extending through the casing and serving to hold the rings 52 and 53 against movement.

It will be noted that the area of the diaphragm 32 which is exposed to the action of the water entering through the inlet 23 is greater in extent than the area of the valve member 42 which is engaged by the same pressure, and said area of the diaphragm is still greater than the valve opening 62 covered by the valve member. As the pressure increases the diaphragm will be distended until it exerts sufficient pull on the rod 36, acting through or against the upper cupped disk 39, to raise the valve member 42 and permit the pressure to escape through the opening 62. This will allow the diaphragm 32 to return to its original position, and, acting against or through the cupped disk 38, reseat the valve member 42 to close the valve. Before and as the valve is being closed, however, sufficient water will be ejected through it to give a pulsation through the conduit 18 to the water in the lower part of the hutch and through the bed of material on the screen 13. The cycle of operation is then repeated. These successive pulsations may be rapid, running as high as several hundred per minute, the effect being to produce a pulsating current of considerable volume through the material above the screen.

The frequency of the pulsations and the volume of the pulsating current may be regulated by adjustment of the valve 22 in the inlet pipe to control the volume and rate of flow of the water. The rapidity of the pulsations and their volume may also be controlled within certain limits by changing the relative areas of the valve member 42 or the diameter of the valve opening 62 with respect to the area of the diaphragm 32.

As so far described the apparatus is operative for its intended purpose. In order to

insure prompt closing of the valve 42, 62, however, it may be desirable to reinforce the operation of the valve by some means such as the spring 63 seated within the cupped disk 39 and engaging at its other end with a cap 64 on the end of a set screw 65 supported by the bracket 27. The set screw may be adjusted to give the spring 63 the amount of tension desired and then fastened in position by means of the lock nut 66. In addition to insuring prompt seating of the valve the spring also sharpens the pulsations of the current and acts as a safeguard to prevent the valve from fluttering. As before stated, however, the device will operate in a fairly satisfactory manner without the spring, and if the spring is not used the bracket 27 may also be omitted.

By changing the tension of the spring as just suggested the rapidity and length of the stroke of the rod 36 may be regulated to effect results similar to those effected by changing the relative dimensions or areas of the diaphragm 32.

The apparatus will run for long periods of time without attention after it is once adjusted to its work, but if repairs are necessary they may easily be made. By removing the bolts 31 or loosening the clamps 33, the ring 26 will be free for removal. The set screws 61 are then backed out far enough to disengage them from the ring 52, whereupon the entire central assembly may be lifted out as a unit and the parts thereof replaced or adjusted.

From the foregoing description of the construction it might be assumed that the apparatus serves only to screen out into the hutch 15 the material which it is desired to recover. That, however, is not the case, as the apparatus also effects a classification or stratification on the screen of minerals according to their different gravities, it working much the same in that respect as concentrating jigs now in use.

If the apparatus is used for washing coal the operation is the same as for ore screening or classifying, the slate and other heavier matter accumulating in the hutch and on the screen, the removal of the slate being effected in any one of several well-known ways. If desired the screen may be omitted and the pulsating current introduced at or near the bottom of the hutch so as to produce a jigging effect on the material in the hutch or equivalent receptacle.

If the apparatus shown in Fig. 2 is to be used for actuating other mechanism instead of supplying a pulsating current for classifying or washing, said other mechanism may be connected directly to the rod 36. Such a change is an obvious one. It is also obvious that instead of using water under pressure the apparatus in question might be operated by means of other fluid supplied under pressure.

While the apparatus shown and described is admirably adapted to fulfill the purposes stated, it is obvious that the inventive ideas are capable of various embodiments and/or adaptations to different uses. It is, therefore, not the desire to be limited to any particular construction except the ones which come within the scope of the claims which follow.

What is claimed is:—

1. In a jigging apparatus, a fluid operated pulsator, an intake and an outlet for fluid adapted to operate said pulsator, a hutch, an intake for said hutch, said outlet of the pulsator and said intake of the hutch comprising a conduit extending from the pulsator to the hutch.

2. In a jigging apparatus, a fluid operated pulsator, an intake and an outlet for fluid adapted to operate said pulsator, a hutch, an intake for said hutch, said outlet of the pulsator and said intake of the hutch being located at opposite ends of a conduit extending from the pulsator to the hutch

3. In a jigging apparatus, a fluid operated pulsator, a hutch, a screen supplied with a quantity of material to be concentrated or classified, an inlet for said pulsator supplied with fluid under continuous pressure, an outlet for said pulsator supplied with the same fluid under pulsating pressure, an inlet for said hutch connected with the outlet of said pulsator whereby said fluid under pulsating pressure is led into said hutch and an outlet for said hutch leading to said screen whereby the fluid under pulsating pressure imparts agitating movement to said material.

4. In a jigging apparatus, a fluid operated pulsator, a hutch, a screen supplied with a quantity of material to be concenterated or classified, an inlet for said pulsator supplied with fluid under continuous pressure, an outlet for said pulsator supplied with the same fluid under pulsating pressure, an inlet for said hutch connected with the outlet of said pulsator whereby said fluid under pulsating pressure is led into said hutch and an outlet for said hutch leading to said screen whereby the fluid under pulsating pressure imparts agitating movement to said material and means comprising a resilient diaphragm for establishing the frequency of the pulsation of the fluid and of the agitation of the material.

5. In a jigging apparatus, a fluid operated pulsator, a hutch, a screen supplied with a quantity of material to be concentrated or classified, an inlet for said pulsator supplied with fluid under continuous pressure, an outlet for said pulsator supplied with the same fluid under pulsating pressure, an inlet for said hutch connected with the outlet of said pulsator whereby said fluid under pulsating pressure is led into said hutch and an outlet

for said hutch leading to said screen whereby the fluid under pulsating pressure imparts agitating movement to said material and means comprising an adjustable spring for adjusting the frequency of the pulsations of said fluid.

6. In a jigging apparatus, a pulsator periodically interrupting the flow of a fluid, a fluid-containing hutch and a conduit interconnecting said pulsator and said hutch whereby the same fluid is utilized to actuate said pulsator and to replenish the fluid supply of said hutch.

7. In a jigging apparatus, a pulsator for periodically interrupting the flow of a fluid, a screen supplied with a quantity of material to be concentrated or classified, a fluid-containing hutch and a conduit interconnecting said pulsator and said screen whereby the same fluid is utilized to actuate said pulsator and said material.

8. In a jigging apparatus, a pulsator for periodically interrupting the flow of a fluid, a screen supplied with a quantity of material to be concentrated or classified, a fluid containing hutch and a conduit interconnecting said pulsator and said hutch whereby the same fluid is utilized to actuate said pulsator, to replenish the fluid supply of said hutch and to agitate said material.

9. In a jigging apparatus, a water operated pulsator, a chamber containing a body of hutch water, an outlet for intermittent discharges of exhaust water from said pulsator and means for directly conducting the discharged water from said outlet into said chamber.

10. In an apparatus of the character described, a sluice, a hutch below and having its top substantially on the same plane as the bottom of the sluice, a screen in the hutch and below the top thereof, a conduit extending below the screen, a valve member for opening and closing the conduit, means comprising a flexible diaphragm for operating the valve member to open and close the conduit, a casing provided with an inlet for an operating fluid between the diaphragm and the valve member, said valve member constituting an outlet for said fluid and said outlet connected by said conduit to the intake of said hutch.

11. In an apparatus of the character described, a sluice, a hutch below and having its top in the plane of the bottom of the sluice, a screen in the hutch and below the top thereof, a conduit extending through the screen to a point adjacent the bottom of the hutch and constituting an inlet for fluid to the hutch, a valve member movable to open and close the upper end of the conduit, said valve member constituting an outlet for fluid discharged from a fluid operated pulsator whereby the operating fluid of the pulsator is subsequently employed to fill the hutch, said pulsator comprising a flexible diaphragm spaced from the valve member and connected thereto by a rod, a spring above the diaphragm tensioned by movement of the diaphragm, a casing provided with an inlet for an operating fluid between the diaphragm and the valve member, a valve for regulating the flow through the inlet and a flexible guide for the lower end of the aforesaid rod and the valve member connected thereto.

In testimony whereof I hereto affix my signature.

GEORGE C. CRANGLE.