Dec. 11, 1923. 1,477,006

R. A. RILEY ET AL

JIG MECHANISM

Filed March 25, 1922 2 Sheets-Sheet 1

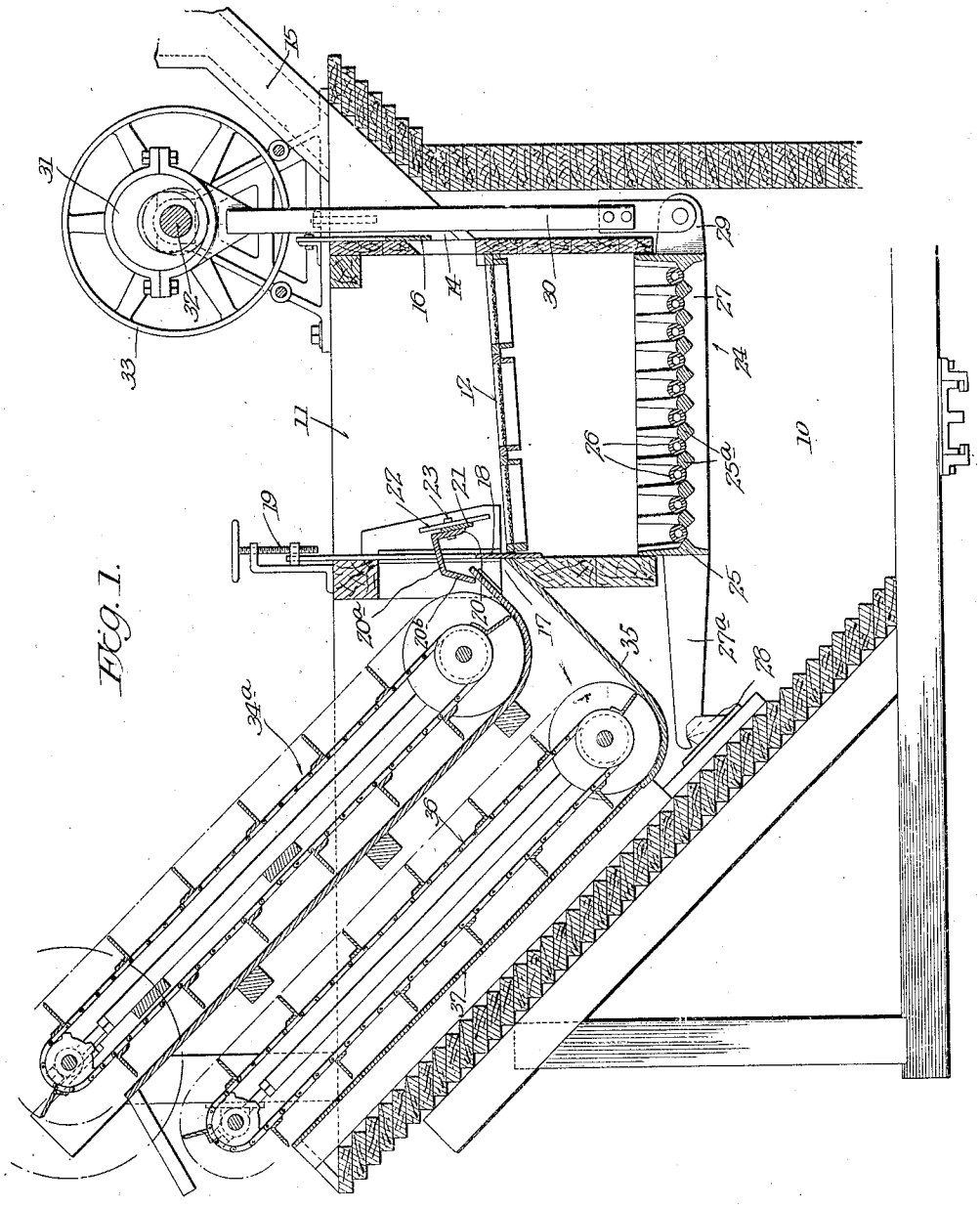


FIG. 1.

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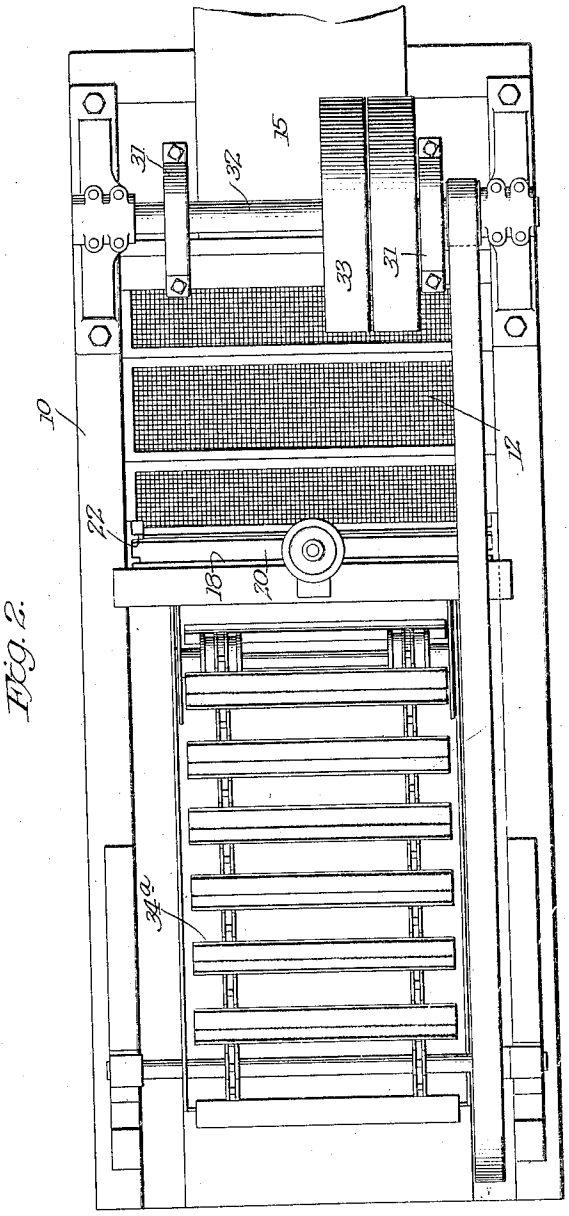


Fig. 2.

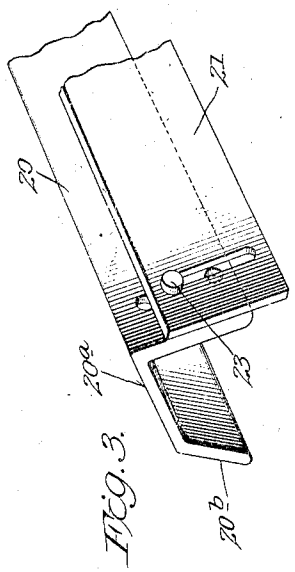


Fig. 3.

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UNITED STATES PATENT OFFICE.

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JIG MECHANISM.

Application filed March 25, 1922. Serial No. 546,723.

To all whom it may concern:

Be it known that we, ROBERT A. RILEY and HAROLD O. KNAPP, citizens of the United States, residing at Pottsville, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Jig Mechanism, of which the following is a specification.

This invention relates to jig mechanism of the type used for removing impurities from coal and for other similar operations, as for instance in connection with ore separation.

It is the general object of the invention to provide a jig mechanism which is simple in construction and operation and highly efficient.

For a full understanding of the points of novelty constituting the invention and the principles of operation, reference is made to the accompanying drawings in which—

Fig. 1 is a vertical sectional view through an apparatus embodying the invention;

Fig. 2 is a plan view thereof, and

Fig. 3 is a fragmentary perspective view of a detail.

In the drawings 10 represents a tank, which, as indicated, may preferably be composed of strips of wood joined, as is the usual practice, in abutting relation and superposed in overlapping relation to the joints. It is understood, however, that the character of the tank is of no importance to the invention proper.

Within the tank 10 is built a box 11 open at the bottom. Intermediate the top and bottom the box 11 contains a screen 12 which may consist of a plurality of sections and may be slightly tilted to promote the travel of the material from the intake end to the outlet end. An opening 14 at the intake end is connected with a chute 15 and the opening may be controlled by a gate 16. The discharge opening 17 is controlled by a gate 18 which may be operated by means of a screw 19 or the like. Between the intake opening 14 and the discharge opening 17 is disposed a baffle which extends, transversely of the direction of motion of the material, either entirely or partly across the box, as desired. This baffle may be adjusted in vertical direction to determine the distance between its bottom edge and the screen, the distance of its upper edge from the screen, or both.

While there is considerable latitude in this respect, we prefer to make the baffle of two parts which are adjustable relatively to each other. Thus the baffle may consist of a portion 20 carrying at its upper end a table 20^a terminating in a deflected portion 20^b and a plate 21. The portions 20 and 21 may be secured to strips 22 on the opposite side walls of the box by means of bolts 23. The strips 22 may have a plurality of openings for vertically shifting the portion 20 and the plate 21 may have slots admitting of adjustment of the plate independently of the portion 20. When the bolts 23 are drawn up, the two component parts of the baffle may be held in adjusted position.

Into the bottom of the box 11 extends a piston 24 comprising a box frame 25, a relatively large number of spaced bars 25^a defining valve seats and cylindrical valve elements 26 adapted to be seated upon the valve seats. The piston is carried upon a frame 27 suspended at three points. The arm 27^a of the frame 27 is pivotally supported upon a wedge shaped bearing 28 midway between the side walls of the tank while on the opposite side lugs 29 are pivotally connected to the lower ends of connecting rods or straps 30 to which motion is imparted by means of eccentrics 31 mounted upon a shaft 32 which in turn may carry pulleys 33 for power transmission.

The discharge opening 17 is divided into two parts by the table 20^a and the deflected portion 20^b. The resultant opening below the table constitutes an outlet for the slate or other impurities heavier than the coal while the resultant opening above the table forms an outlet for the coal. The coal is discharged over the table 20^a and plate 20^b into a conveyor trough 34 from which it is transferred by any suitable conveyor 34^a as for instance of the usual drag line type. A similar trough 35 is connected with the opening below the table 20^a, and a like conveyor 36 may be used for transferring the slate. The bottom 37 of the trough 35 is perforated to allow the water to flow off and return to the lower part of the tank.

The operation is as follows:

The tank 10 is filled with a liquid, for instance water, to a level above the table 20^a and shaft 32 is rotated. By means of the eccentrics the rotary motion of shaft 32 is translated into reciprocating motion of the connecting rods 30 causing a reciprocating

motion of the piston. When the piston rises, the valve elements 26 are forced to their seats and when the piston descends, they move away from their seats and allow the liquid to pass through the openings defined by the bars 25^a, as is well understood. The arrangement thus has the characteristics of a pump by which the liquid is circulated upwardly through the box 11 out through the discharge opening 17.

During each upward stroke of the piston a certain quantity of liquid, which varies with the length of the stroke, is forced through the screen and exerts an impact upon the material upon the screen. As is well understood, due to this impact the materials of lesser specific gravity are carried upward a greater distance than the materials of greater specific gravity. Conversely during the downward stroke of the piston, the agitated materials tend to settle again and the rate of settling is proportional to the specific gravity. The action of the piston, both during the up stroke and the down stroke, thus induces a separating action which results in stratification of the materials according to their specific gravity.

As the material continuously passes through the intake opening 14 it exerts a pressure upon the stratified material which under the force of this pressure and under the influence of the liquid moves toward the discharge opening, the lighter material passing over the upper edge of the baffle and over the table, the heavier material passing uder the baffle and over the gate 18.

This principle of separating coal from slate or lighter from heavier material is not new in itself and no claim is made to the broad application of it.

The principal point of novelty is the particular type of piston for transmitting the liquid impulses or impacts to the material. By means of the arrangement described a maximum amount of liquid may be brought nto action upon the material per unit of time or during a single stroke. In fact the bars forming the valve seats are made just large enough to withstand the stress incident to the lifting of the column of liquid above the piston. At the same time the resistance of the flow of liquid is reduced to a minimum. The effect of a small resistance upon the economy of operation is evident, particularly when a weighted pulley is used or a fly wheel is attached to the shaft. It is also clear that due to the large aperture the capacity of the apparatus relatively to its size must be large in proportion.

While, as above explained, the particular construction and disposition of the piston is instrumental in effecting a maximum working capacity relatively to the bulk of the apparatus, the arrangement has another very material functional significance. Due to the fact that the piston has angular movement about the pivot bearing 28 as center, the vertical movement of the end of the piston nearest to the pivot point is relatively small while the movement of the opposite end is relatively great, the distance of movement and the rate of movement of each point being proportional to its distance from the pivot. It is thus evident that during the upstroke the liquid within the box 11 is lifted at different rates of velocity and that the rate of volume displacement in vertical direction varies with the rate of motion of the piston at different points. More liquid passes through the screen nearer the intake opening and the material there is subject to greater buoyant action or lifting impulse of the liquid than the material nearer the discharge opening. Due to these stronger impulses tending to force the material up higher near the intake than near the discharge end the strata of the material have a distinct tendency to move toward the discharge opening in analogy to the rolling of bodies down an inclined plane. This tendency is accentuated by the action of the liquid. The liquid unlike a solid, has the faculty of levelling out. The greater velocity of the liquid at the intake side of the box 11 would in accordance with the law of inertia move to a higher point than the liquid at the other side, if it were not for its levelling action. However, under the influence of the forces this levelling motion takes place from the intake side toward the discharge side and thus induces motion of the stratified material in addition to and in co-operation with the other forces above referred to.

The baffle plate 21 is normally adjusted to allow only a definite stratum to pass under its bottom edge. The exact adjustment required depends, of course, upon the nature of the materials to be separated. The gate 18 is adjusted to allow the discharge of the material of greater specific gravity into the conveyor trough 35 and at the same time to hold back and dam the material upon the screen to maintain a stratum of a depth sufficient to seal the opening defined by the screen and the bottom edge of the baffle. The portion 20 and table 20^a are adjusted to allow the lighter material to readily pass over the table.

Generally, the adjustment of the baffle plate 21, gate 18 and table 20^a depends upon the relative specific gravities of the lighter and the heavier material to be separated from one another and upon the quantitative proportion of the two materials.

The liquid carried away with the material passing through the discharge opening returns over the sides of trough 34 into trough 35 and through the perforated bottom or screen 37 down to the bottom of the tank. It is therefore only necessary to con-

tinuously add a small quantity of liquid sufficient to replace the small quantity which is inevitably carried out of the tank with the material upon conveyors 34[a] and 36. The level in the tank may, of course, be kept constant by any of the many well known means adapted for such a purpose, if desired.

In the foregoing has been described an apparatus constituting what is at present considered as the preferred embodiment of the invention and only so much of the structure has been described in detail as is necessary to explain the principles of operation. It is obvious, however, that the construction is susceptible of various changes and modifications within the scope of the invention. For the sake of simplicity, no means have been shown for changing the degree of eccentricity of the eccentrics and the stroke of the piston, since such means are well known and generally understood. In fact any other well known means for imparting reciprocating action to the piston may be adopted. There is considerable latitude in regard to the form of the piston. The bars 25[a] may be varied within wide limits to increase the effective aperture without impairing the lifting strength. The cylindrical valve elements 26 may be made of different materials, preferably rubber having a hollow space of suitable dimension. It is thereby possible to determine to a nicety the proper proportion of the weight of the valve elements 26 to the weight of the liquid they displace in order to make them sensitive and responsive in any desired degree to the motion of the piston. At any rate, the particular form of the valve elements and their special characteristics is entirely a matter of engineering skill and judgment within the scope of the invention.

We claim:

1. In a jig, the combination of a screen, a box surrounding the screen and defining an upward passage through the screen and a piston extending into the bottom of the box, bars defining axial passages through the piston and providing valve seats, valve elements above the piston mounted for movement toward and away from the seats in a direction at right angle to the plane of the piston, a lever for supporting the piston, means for pivotally supporting one end of the lever and means at the opposite end of the lever for moving it about the pivot, the bars extending in parallel relation between opposite walls of the box and the valve elements being cylindrical bodies.

2. In a jig, the combination of a box, a screen therein, an intake in one wall of the box, an outlet in the opposite wall, a baffle arrangement between the intake and the outlet comprising a plate extending between the side walls of the box, a plate in contact with said plate and carrying at its upper end a table extending through the discharge opening and dividing it into an upper and a lower opening, means for adjustably securing the said plates to each other and to the said side walls and a gate for controlling the lower opening.

3. In a jig, the combination of a tank, a box in the tank containing a screen, means for intermittently passing liquid upwardly through the screen, an intake in one wall of the box, superposed outlets in the opposite wall, a baffle dividing the box into two compartments containing the upper and the lower outlet respectively, the baffle being spaced from the screen to form the sole communication between the two compartments, a conveyor trough in the tank connected with the upper outlet and a conveyor trough below the said trough and connected with the lower outlet, the lower conveyor trough having a perforated bottom.

In testimony whereof, we affix our signatures.

ROBERT A. RILEY.
HAROLD O. KNAPP.