

B. RUSSELL & E. SAVAGE.
JIG FOR WASHING COAL AND SIMILAR SUBSTANCES.
APPLICATION FILED AUG. 18, 1911.

1,011,496.

Patented Dec. 12, 1911.

3 SHEETS-SHEET 1.

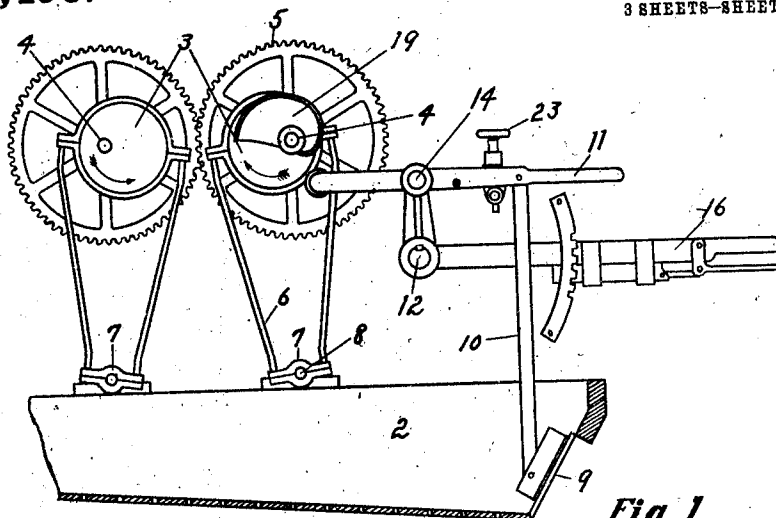


Fig. 1

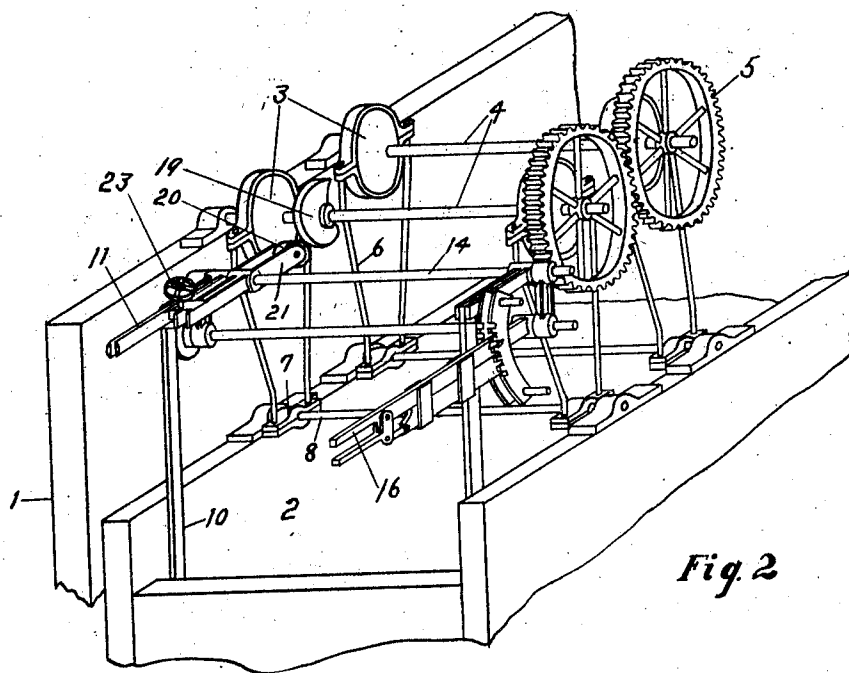


Fig. 2

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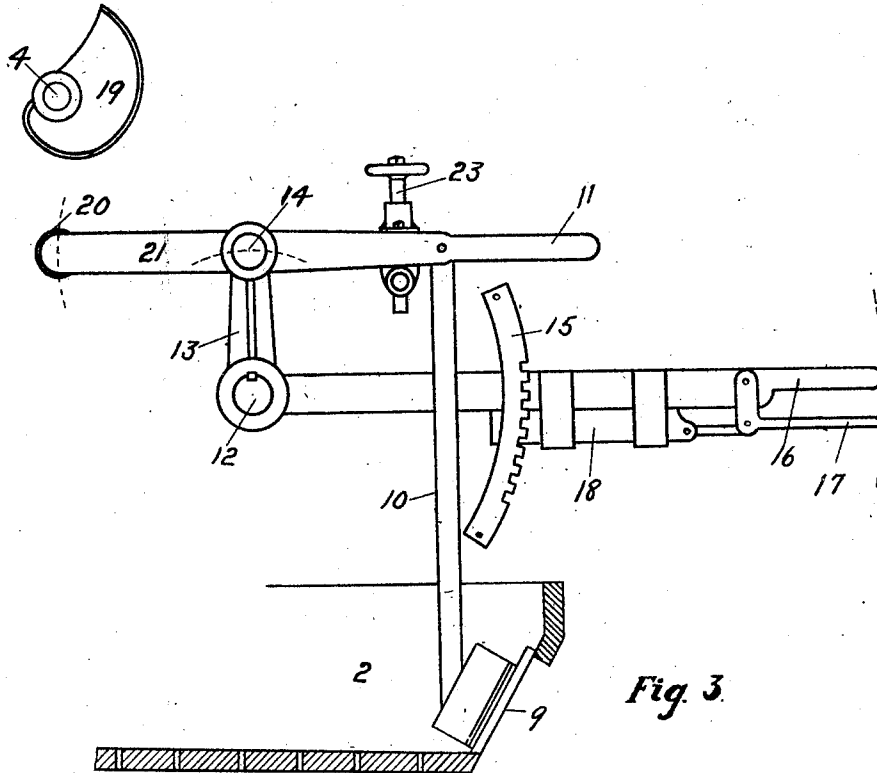


Fig. 3.

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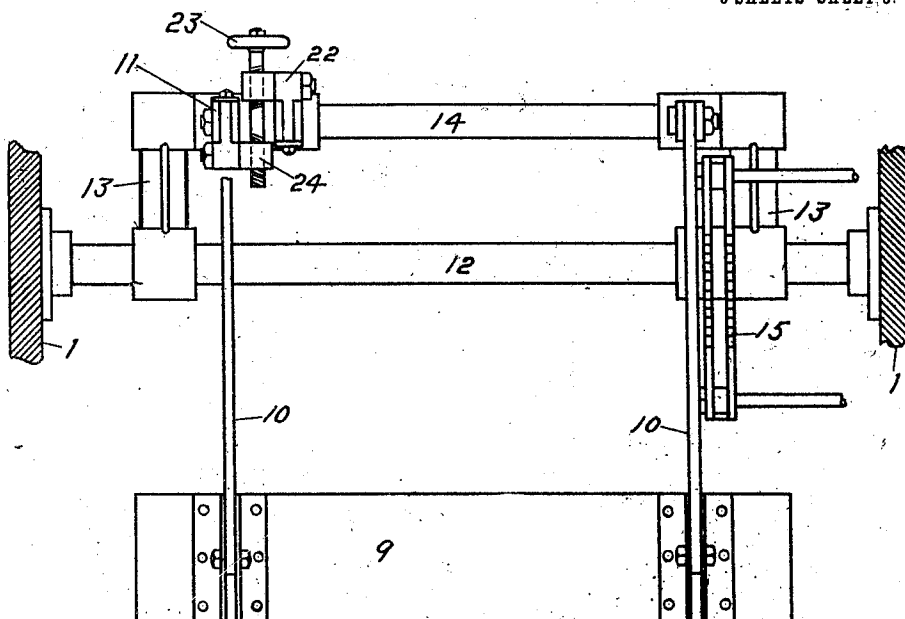


Fig. 4

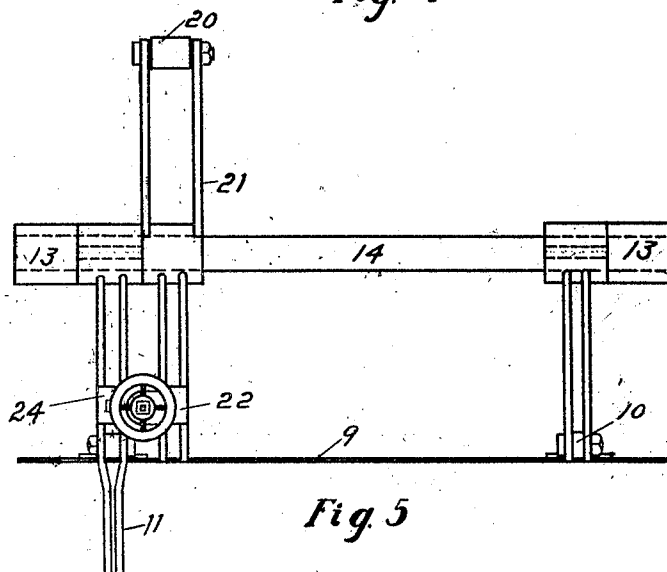


Fig. 5

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UNITED STATES PATENT OFFICE.

BERTRAND RUSSELL AND EDWARD SAVAGE, OF SAGINAW, MICHIGAN, ASSIGNORS OF
ONE-THIRD TO ROBERT M. RANDALL, OF SAGINAW, MICHIGAN.

JIG FOR WASHING COAL AND SIMILAR SUBSTANCES.

1,011,496.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed August 18, 1911. Serial No. 644,821.

To all whom it may concern:

Be it known that we, BERTRAND RUSSELL and EDWARD SAVAGE, both citizens of the United States, residing at Saginaw, in the
5 county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Jigs for Washing Coal and Similar Substances; and we do hereby declare the following to be a full, clear, and
10 exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to devices for so-called "washing" of coal, ores, and similar
15 substances, the washing consisting in the separating of the substance into materials of different specific gravity, such as for instance, the separating of sulfur and slate from coal, the coal being of lighter specific
20 gravity than the impurities to be removed.

The improvement pertains more particularly to that class of washing devices commonly termed jigs, consisting of a vessel in
25 which the substance, as for instance coal, is introduced with water, and the coal and water are agitated together, with means for flowing off the coal and water at the top and drawing off the refuse accumulated at the bottom.

30 In the type of jig to which our invention is applied, the material is carried in a box with perforated bottom which is moved up and down in a tank of water. Material to be washed, as for instance coal, is received
35 on this screen plate and the pulsating action of the water as the jig moves up and down, agitates and suspends the mass, separating the lighter material, *i. e.* the coal, which flows off the top of the jig, from the refuse,
40 which settles on the screen and is allowed to escape gradually through the opening of a jig valve or gate. In this type of jig to which our invention is applied, a valve is provided at the forward end of the jig box
45 and set at the desired opening. The excess refuse beyond what is needed for a suitable depth of bed is allowed to flow out underneath the valve, the purpose being to prevent the accumulation of so heavy a bed of
50 refuse on the screen as to interfere with the proper upward flow of the water through its perforated bottom. Another function of the refuse bed on the screen is to prevent

the finer particles of coal being drawn down through the perforated bottom by the re- 55
ceding of the water.

There are serious disadvantages in the type of jig above referred to, in which the valve is set at a certain opening and remains there until reset by hand. When the valve 60
is set to a given position the refuse bed grows to corresponding depth, determined by the adjustment of the valve. The disadvantages of such a jig will be understood if it is assumed, first, that the valve is set so 65
as to accumulate a bed of proper thickness for the material passing through, so that coal is not carried out underneath the valve but floats properly over the top of the jig. Now, assume that the nature of the material 70
changes so that a greater percentage of good coal enters the jig; the bed becomes thinner and the relation of bed thickness to valve opening changes so that a large proportion of coal goes to waste through the 75
valve opening. This results in a direct loss of coal. If, on the other hand, the nature of the material changes so that a greater percentage of refuse enters the jig, then the thickness of the bed increases and throttles 80
the valve opening, and a considerable quantity of refuse passes out through the overflow with the washed coal. Furthermore, the valve being set at a fixed opening, remains open while the jig is going down. 85
Water rushes rearward into the jig through the valve opening during the down-stroke and rushes out from the same opening during the up-stroke. Since the work of separating is done only on the down-stroke of 90
the jig, that is, when the shale and coal are both suspended by the water as it pours up through the perforated bottom of the jig, it is apparent that the surging of a solid stream of water into the jig through the 95
valve opening while the jig is on its down-stroke, produces agitation at the delivery end of the jig and prevents the efficient separation of the material. That is to say, a solid stream rushes in and boils up near 100
the valve opening (where the final separation is taking place) and floats considerable shale out through the overflow together with the coal.

It is the purpose of our invention to overcome these difficulties and to greatly in- 105

crease both the efficiency of separation and the capacity of the jig.

A further purpose is to provide means by which the bed of shale is made to travel forward along the bottom of the jig, advancing a small distance with each down-stroke of the jig. The shale bed is then automatically agitated and loosened so as to permit the upflowing water to properly float the coal, and the bed is prevented from settling and thereby obstructing the inflow of water. By this means we have increased the output of a jig thirty per cent. and improved the quality of the washed product.

To this end we have devised means for automatically producing a valve movement of the jig and to regulate that movement so that the valve remains closed during the down-stroke and opens on the up-stroke of the jig, and we also provide means by which the amount of opening may be quickly and accurately gaged to suit changes in the material being handled, without stopping the jig.

It has been ascertained in practice that a small variation of the valve opening, due to wear of the parts, materially affects the efficiency of the jig. In order that the functions performed by our improvement may be better understood, it is to be noted that it is of great importance that means for regulating the opening of the valve be provided. A change in the rate of feed to the jig alters the volume of shale to be passed out through the valve opening. If the rate of feed is suddenly increased, the quantity of shale increases correspondingly, the thickness of the bed increases and the jig will fill with shale unless means is provided for quickly and accurately gaging the amount of opening of the valve to suit the varying thicknesses of the shale bed. If, on the other hand, the quantity of material is reduced, the thickness of the shale bed decreases and means must be provided for quickly changing the maximum opening of the gate in order to prevent coal escaping with the shale. With some grades of coal at some rates of feed, it is important that the valve regulating device shall be capable of adjusting the position of the valve through very small ranges and this adjustment must be made not only quickly but also accurately. Such fluctuations in the quantity or in the grade of material occur very often, but at irregular intervals, especially in washers that handle the product of two or three mines.

Our invention, therefore, provides means not only for keeping the gate closed on the down-stroke of the jig, but also for quickly and accurately adjusting the maximum opening of the gate to meet the conditions above referred to, and further provides automatic means for accomplishing these re-

sults, the valve-controlling mechanism being so constructed as to cause the valve to move up and down with the jig, but to automatically close and open as the jig moves up and down.

With these objects in view and certain others, which will appear later in the specification, our invention consists in the devices and the equivalents thereof, as set forth and claimed.

In the accompanying drawings, Figure 1 is a side sectional view of a jig with our improved valve-regulating mechanism attached; Fig. 2 is a perspective view of the jig, one side of the tank being removed to show the mechanism and the jig being broken away; Fig. 3 is an enlarged side view of the valve-operating mechanism; Fig. 4 is a front view broken away in part; and Fig. 5 is a partial top plan view.

The construction and mode of operation of the device is as follows:

1 represents the water tank in which the jig 2 is actuated up and down by means of eccentrics 3 mounted on the shafts 4 which are driven by suitable gearing 5. The jig 2 is carried by suspension rods 6 secured at their upper ends to the straps of the eccentrics 3 and at their lower ends to bearings 7 in which are received shafts 8, the ends of which are journaled to the jig 2.

9 is the vertically movable jig valve suspended from vertical links 10 which are adapted to be raised and lowered by the hand lever 11. The hand lever 11 is fixed to a cross-shaft 14 which is journaled in the upper bearing of a pair of upright arms 13. The arms 13 are keyed to a rock shaft 12, the ends of which are journaled to the sides of the tank 1. To rock shaft 12 is also fixed a lever 16 adapted to engage a fixed quadrant 15. Raising and lowering the handle of lever 16 moves shaft 14 toward or from the front of the jig for a purpose which will presently be explained. Lever 16 is provided with a hand piece 17 adapted to actuate the detent bar 18 that engages the quadrant. Raising or lowering lever 11 opens or closes valve 9, this function being the same as in previous machines above referred to.

To automatically open valve 9 on the up-stroke of jig 2 and to close it during the down-stroke, we provide the following mechanism: A horizontal arm 21 is journaled on the shaft 14 and carries at one end a roller 20 and at its opposite end a block 22, in which block is threaded a right- and left-hand screw 23. Adjacent to arm 21 and keyed to rock shaft 14 is the lever 11 above described. This lever also carries a block 24 threaded to receive the lower end of screw 23. The lever 11 and arm 21 can be angularly adjusted with relation to each other by turning the screw 23, as indicated

in Fig. 4. A cam 19 is fixed to one of the revolving shafts 4 and is adapted to intermittently engage roller 20.

The operation of the machine is as follows: The valve 9 being closed as shown in Fig. 3, the jig 2 is lowered by the revolving eccentrics 3, and the valve 9 descends with the jig 2, the lever 11 descending and the roller 20 rising. When the jig 2 has reached the bottom of its travel and is about to begin its upward stroke, cam 19 contacts with roller 20, depressing it and raising the valve 9, thereby opening it while the jig 2 is rising. The amount of opening actually afforded by the valve while the jig is rising depends upon the relative adjustment of the roller 20 and the cam 19 and this adjustment can be varied by moving shaft 14 toward the front of the jig, *i. e.*, away from the cam, by means of the lever 16, or a finer adjustment may be had by raising or lowering roller 20 with reference to lever 11 by means of the right- and left-hand screw 23. This latter adjustment may also be used for the purpose of taking up wear of the parts after long use.

It will be observed that valve 9 normally remains closed, the lever 11 and roller 20 riding up and down with the motion of the jig, except when roller 20 is contacted by cam 19. The time of such contact and also the amount that roller 20 is depressed depends upon the size and shape of cam 19 and also upon the adjusted position of lever 16, so that by properly adjusting lever 16, any desired amount of opening can be imparted to valve 9 and the time of opening can also be regulated. It is therefore only necessary for the operator of the jig to observe the thickness of the shale bed and to note the quality of the washed product and if a change is desired, it can be quickly accomplished by shifting lever 16. The device also enables the operator to clear the jig of shale at any time by opening the valve 9 to its fullest extent by means of lever 11. Releasing lever 11 allows valve 9 to return to its adjusted condition and to play up and down with the jig, remaining closed on the down-stroke and to open on the up-stroke. It will be noted that after shifting lever 11 as above described, the valve returns to its adjusted position without the necessity of resetting lever 16.

Having described our invention, what we claim and desire to secure by Letters Patent, is:—

1. In combination with a jig and means for moving said jig up and down; a vertically movable valve; a horizontally disposed arm, vertical links connecting said arm to said valve, a revoluble cam actuated by the jig-moving means and adapted to intermittently contact with one end of the horizontal arm, and means adapted to move the free end of the horizontal arm toward or from the front of the jig, whereby to regulate the travel of said valve with relation to the jig.

2. In combination with a jig and means for moving said jig up and down; a vertically movable valve; a horizontally disposed arm, vertical links connecting said arm to said valve; a revoluble cam actuated by the jig-moving means and adapted to intermittently contact with one end of the horizontal arm, and means for regulating the travel of said valve with relation to the jig, comprising a cross-shaft carrying said horizontal arm, upright arms supporting said cross-shaft, a pivotally mounted rock shaft having the lower ends of said upright arms fixed thereto, a quadrant lever fixed to said cross-shaft, and a fixed quadrant adapted to be engaged by said quadrant lever.

3. In combination with a jig, and means for moving said jig up and down; a vertically movable valve; a horizontally disposed arm, vertical links connecting said arm to said valve, screw adjusting means carried by said arm, adapted to slightly adjust the angular position of said arm with relation to said vertical links, a revoluble cam actuated by the jig-moving means and adapted to intermittently contact with one end of the horizontal arm, and means adapted to move the free end of the horizontal arm toward or from the front of the jig, whereby to regulate the travel of said valve with relation to the jig.

In testimony whereof, we affix our signatures in presence of two witnesses.

BERTRAND RUSSELL.
EDWARD SAVAGE.

Witnesses:

CHRISTINE A. BRAIDEL,
GEO. W. SMITH.