UNITED STATES PATENT OFFICE.

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AUTOMATIC VALVE FOR COAL-WASHERS.


To all whom it may concern:

Be it known that I, WILLIAM M. DUNCAN, a citizen of the United States, residing in Alton, in the county of Madison and State of Illinois, have invented certain new and useful Improvements in Automatic Valves for Coal-Washers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a valve for automatically controlling the outlet through which slate or other heavy foreign matter escapes from the jig of a coal-washer, whereby when the coal is being delivered into said jig the impurities-outlet therefrom will be automatically kept in an open condition and when such delivery ceases the outlet will be closed.

My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure 1 is a view of a coal-washer equipped with my automatic valve, in horizontal section, taken approximately on line II, Fig. 11.

Fig. II is a vertical longitudinal section taken on line II, Fig. 1. Fig. III is a view, partly in vertical section, taken on line III, Fig. II, with the valve-controlling mechanism at the rear of said line shown in elevation. Fig. IV is a view, partly in section, taken on line IV, Fig. III, with parts of the valve-controlling mechanism illustrated in elevation looking in the direction of the arrow at said line. Fig. V is an elevation showing one of the rock-shaft boxes on the washer-jig.

1 designates the washing-tank of the coal-washer inclosed by a framework 2.

3 designates a pair of horizontal shafts mounted on the framework 2 and provided with eccentrics 4. One of the shafts 3 is equipped with a belt-pulley 5, to which power may be communicated, and a sprocket-wheel 6, and the other shaft is equipped with a sprocket-wheel 7, that in common with the sprocket-wheel 6 receives a chain 8, through the medium of which power is transmitted from the pulley-carrying shaft.

9 designates eccentric-boxes mounted on the eccentrics 4 and supporting hanger-rods 10.

11 is a jig located in the washing-tank 1 for vertical reciprocation thereon. This jig is connected to the hanger-rods 12, hung from the hanger-rods, and shafts 13, that pass through said boxes that are loosely fitted in boxes 14, secured to the jig 11. By this described construction the jig 11 is so supported that upon the rotation of the shafts 3 with their eccentrics the jig is reciprocated in a vertical direction to slush water in the tank 1, through its perforated bottom 15. The perforated bottom of the jig is preferably inclined toward an outlet 16 at one end thereof, through which slate or other heavy impurities find exit in the reciprocation of the jig.

17 designates a cross-bar located above the 65 discharge end 11 of the jig, the ends of which are secured to the framework of the coal-washer, as seen in Fig. 1.

18 designates a pair of inverted-U-shaped boxes mounted upon the jig 11 at its discharge 70 end, and 19 is a rock-shaft having its ends loosely fitted in said U-shaped boxes for vertical movement therein. Endwise movement of said shaft 19 is prevented by collars 20, that are secured to the shaft and rest against the 75 bearing-boxes 18. (See Figs. I and III.)

21 designates collars fixed to the rock-shaft 19 and provided with arms 22, to which are connected links 23, that are pivoted at their lower ends to a gate-valve 24, that controls the outlet 16 and is governed by movement of the rock-shaft 19 in the manner to be hereinafter explained.

25 designates a pair of collars loosely mounted on the rock-shaft 19. Each of these 85 collars is provided with a hook-arm 26, having a hook 27 at its free end, that is adapted to engage the cross-bar 17 under a condition to be hereinafter stated. The hook-arms 26 are united by a cross-bar 28. The loosely-mounted collars 25 also carry counterbalance-arms 29, on which are mounted adjustable counterbalance-weights 30. The hook-arms 26 are located at the rear of the cross-bar 17 to swing forwardly thereto and the 95 counterbalance-arms 29 projected forwardly from the rock-shaft 19 in advance of the vertical plane occupied by the cross-bar 17.
31 designates a sleeve fixed centrally to the rock-shaft 19 and bearing rearwardly-projecting ears 32 and forwardly-projecting ears 33. Secured to the rearwardly-projecting ear 32 is a counterbalance-arm 34, that bears an adjustable counterbalance-weight 35. The counterbalance property of the arm 34 and its weight 35 is in excess of the counterbalance-arms 29 and weights 30, 30, so that the arm 34 may move to overcome the arms 29 and, in addition thereto, certain other parts to be hereinafter referred to in a statement of the operation of the mechanism. 36 designates a bell-crank lever pivoted at 37 to the forwardly-projecting sleeve-ears 33 and having a heel 38, that projects rearwardly in the direction of the cross-bar 28, which unites the hook-arms 26. 39 designates a trip-pan pivotally supported by brackets 40, mounted on the jig 11 at its forward end, so as to swing downwardly toward the jig. This trip-pan is united to the bell-crank lever 36 by a connecting-rod 41, that is pivoted at its ends to said lever. In the practical use of a coal-washer equipped with my automatic valve the coal is delivered into the jig 11, into which it enters after falling onto the trip-pan 39 and swinging it downwardly in the direction indicated by the arrow, Fig. II. The jig being in vertical reciprocation the coal, which is washed by the sluicing of water upwardly through the jig, passes from the jig through the outlet 11″ at its discharge end and is delivered over the runway 1″. (See Fig. II.) As soon as the coal strikes the trip-pan 39 and swings it in the manner stated the impurities-outlet 16 is opened by moving the gate-valve 24 upwardly therefrom through the medium of the mechanism connecting said trip-pan to said gate-valve. This is accomplished as follows: When the machine is at rest, the rock-shaft 19 occupies a position at the bottom of the inverted-U-shaped boxes 18, mounted on the jig 11, the parts being at this time in the positions illustrated in Figs. I, II, and III and the gate-valve 24 being closed. Immediately upon the coal delivered to the jig 11 striking the trip-pan 39 and swinging said pan downwardly the bell-crank lever 36 is pulled forwardly by reason of the weight of coal against the pan 39 overcoming the resistance of the counterbalance-arm 34. As this movement takes place the hook-arms 26, previously restrained from forward movement by the heel 38 of the bell-crank lever 36, as seen in Fig. II, are relieved of such resistance and the hook-arms are permitted to be swung forwardly by the counterbalance-arms 29, which, with the hook-arms, are loosely positioned on the rock-shaft 19, as described. Then when the jig 11 moves upwardly in its reciprocation subsequent to the freeing of the hook-arms the rock-shaft is raised therewith and said hook-arms move to the fixed cross-bar 17, their hooks engaging over said cross-bar, as seen in Fig. IV, thereby holding the rock-shaft 19 in an elevated position and maintaining the gate-valve 24, depending from said rock-shaft, from vertical movement with the jig 11. While the rock-shaft 19 is upheld, the boxes 18 operate loosely thereon during the reciprocation of the jig, and the jig and boxes 18 rise and fall independently of the rock-shaft. The result is that when the parts 75 have been positioned as described the jig may reciprocate in a vertical direction while the coal is being delivered thereinto to be washed, and each time that the jig is moving downwardly the washed coal will be discharged through the coal-outlet 11″, while the slate and other heavy impurities will be discharged through the impurities-outlet 16, owing to the valve being held elevated during such downward travel of the jig. Conversely, when the jig 11 is moving upwardly its impurities-outlet is carried upwardly to the valve 24 in its elevated position, and said outlet is thereby closed by the valve to prevent the coal being washed out therethrough while in the jig. As long as coal is being delivered into the jig, it constantly holds the trip-pan 39 downwardly and maintains the gate-valve in elevated position, so that the operation will be as stated. When, however, the delivery of coal ceases, the counterbalance-arm 34 overcomes the resistance of the trip-pan 39, bell-crank lever 36, and causes the heel of said bell-crank lever to press against the cross-bar 28, connecting the hook-arms 26, so that the hooks of said arms will be thrown away from the fixed cross-bar 17 and permit the rock-shaft 19 to descend in the inverted-U-shaped boxes 18, thereby lowering the gate-valve to close the impurities-outlet 16 and prevent the escape of coal therethrough when its washing operation is not being carried out.

I claim as my invention—

1. The combination with a vertically-reciprocating coal-washer jig having an impurities-outlet, of a valve for controlling said outlet mounted to reciprocate with the jig, and means connected with the jig and valve for arresting the reciprocation of said valve when in an elevated position.

2. The combination with a vertically-reciprocating coal-washer jig having an impurities-outlet, of a valve for controlling said outlet mounted to reciprocate with the jig, means for arresting the reciprocation of said valve when in an elevated position, and means for retaining the valve in engagement with said arresting means.

3. The combination of the jig of a coal-washer having an impurities-outlet, of a valve for controlling said outlet, means by which said valve is carried, a fixed member with which said valve-carrying means engages to hold the valve in an elevated position with respect to said outlet, and means for retaining
said valve-carrying means in engagement with said fixed member while the coal is entering the jig, having a portion mounted in a position to be operated by the coal delivered into said jig, substantially as set forth.

4. The combination with a coal-washer jig having an impurities-outlet, of a valve for controlling said outlet, a hook having connection with said valve, a fixed member mounted independently of said jig to receive said hook, means for holding said hook under restraint and arranged to be actuated by the delivery of coal into said jig, and means for moving said hook into engagement with said fixed member when relieved of restraint to thereby support said valve in an elevated position, substantially as set forth.

5. The combination with a coal-washer jig having an impurities-outlet, of a valve for controlling said outlet, a rock-shaft slidably positioned above said jig and to which said valve is connected, a counterbalance fixed to said rock-shaft, a trip-pan to receive the coal delivered to said jig and which is connected to said rock-shaft, a fixed member mounted independently of said jig, a hook loosely mounted on said rock-shaft for engagement with said fixed member, and a counterbalance connected to said hook to move it into engagement with said fixed member, substantially as set forth.

6. The combination with a coal-washer jig having an impurities-outlet, of a valve for controlling said outlet, a rock-shaft to which said valve is connected, slotted boxes carried by said jig and in which said rock-shaft is positioned, a fixed member mounted independently of said jig, a hook loosely mounted on said rock-shaft for engaging said fixed member, a counterbalance connected to said hook, a counterbalance fixed to said rock-shaft, a lever pivotally connected to said rock-shaft and arranged to restrain said hook, and a movably-mounted pan connected to said lever and arranged to receive the coal delivered to said jig to actuate said lever and free said hook, substantially as set forth.

7. The combination with a coal-washer jig having an impurities-outlet, of a valve for controlling said outlet, a rock-shaft to which said valve is connected, an inverted-U-shaped box carried by said jig and in which said rock-shaft is positioned, a pair of hook-arms loosely mounted upon said rock-shaft, counterbalance-arms connected to said hook-arms, a cross-bar uniting said hook-arms, a fixed member mounted independently of said jig to receive the engagement of said hook-arms, a counterbalance-arm fixed to said rock-shaft, a bell-crank lever pivoted to said rock-shaft and having a heel to receive the engagement of said hook-uniting cross-bar, a trip-pan to receive the coal delivered into said jig, and a connecting-rod uniting said trip-pan to said bell-crank lever, substantially as set forth.

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In presence of—

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