

(No Model.)

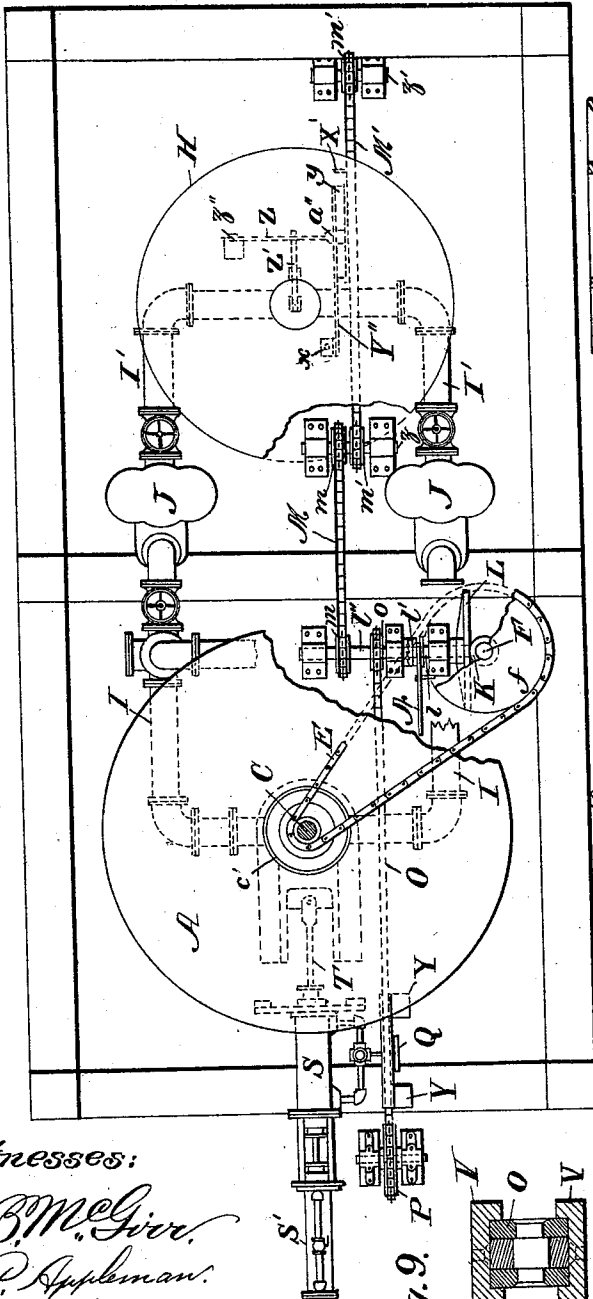
4 Sheets—Sheet 2.

E. RAMSAY & E. DREYSPRING.
COAL AND MINERAL WASHER.

No. 579,840.

Patented Mar. 30, 1897.

Fig. 2.



Witnesses:

J. B. McGirr.
J. P. Appleman.

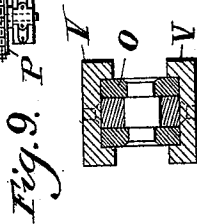


Fig. 9.

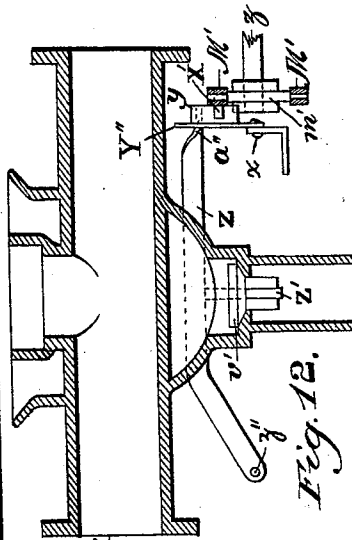


Fig. 11.

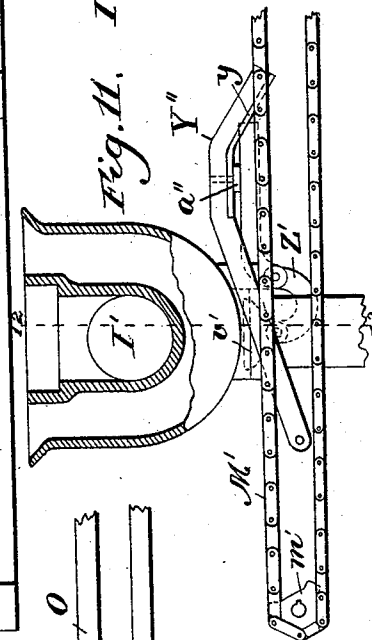


Fig. 12.

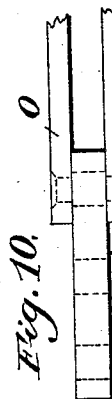


Fig. 10.

Inventors.
E. Ramsay &
E. Drey Spring,
By
Hanson Hanson,
their Attys.

E. RAMSAY & E. DREYSPRING.
COAL AND MINERAL WASHER.

No. 579,840.

Patented Mar. 30, 1897.

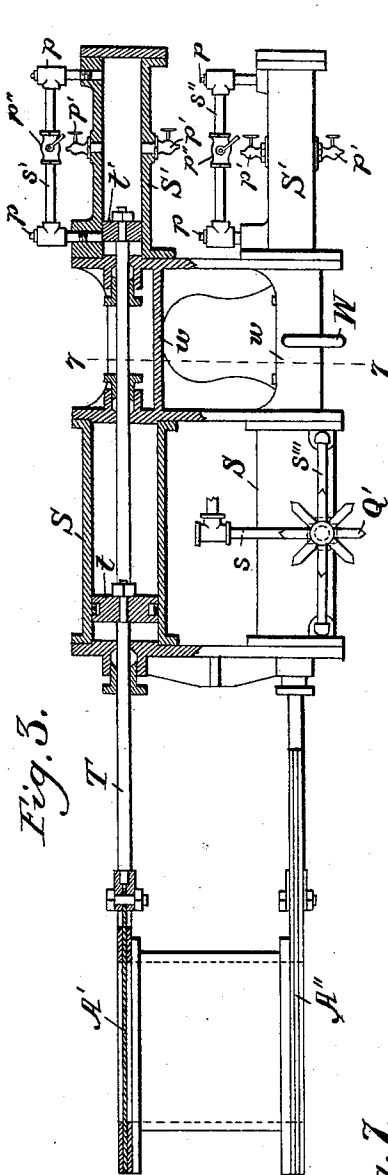


Fig. 3.

Fig. 4.

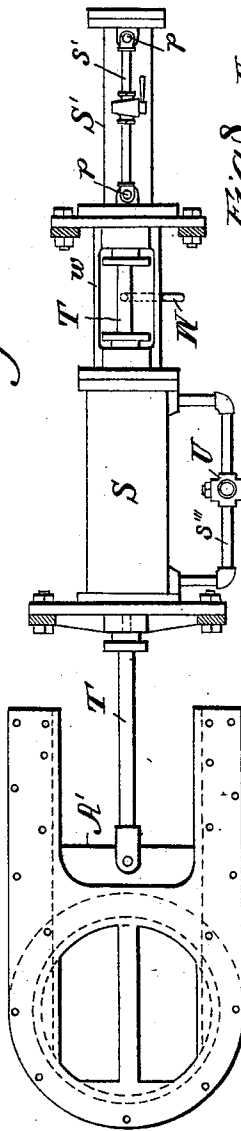


Fig. 7.

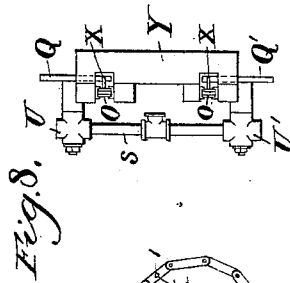
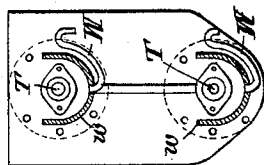


Fig. 8.

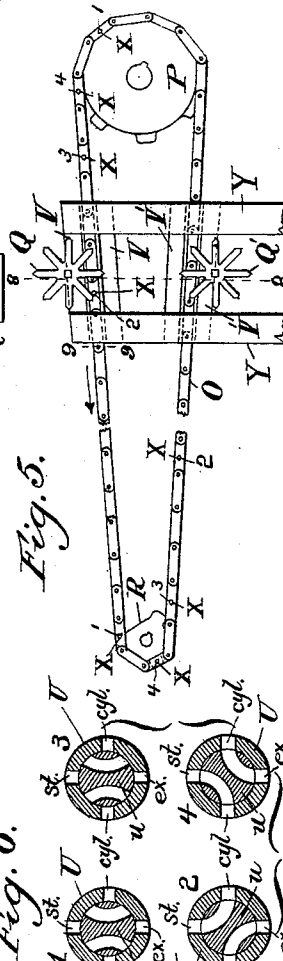
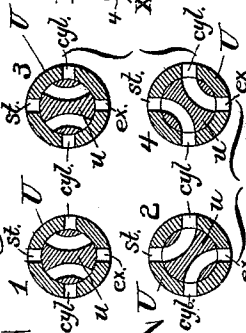


Fig. 5.

Fig. 6.



Witnesses:

J. B. McGirr.
J. P. Appleman.

Inventors.

E. Ramsay,
E. Dreyspring,
By *Hanson* *Hanson*,
their Attys.

(No Model.)

4 Sheets—Sheet 4.

E. RAMSAY & E. DREYSPRING.
COAL AND MINERAL WASHER.

No. 579,840.

Patented Mar. 30, 1897.

Fig. 15

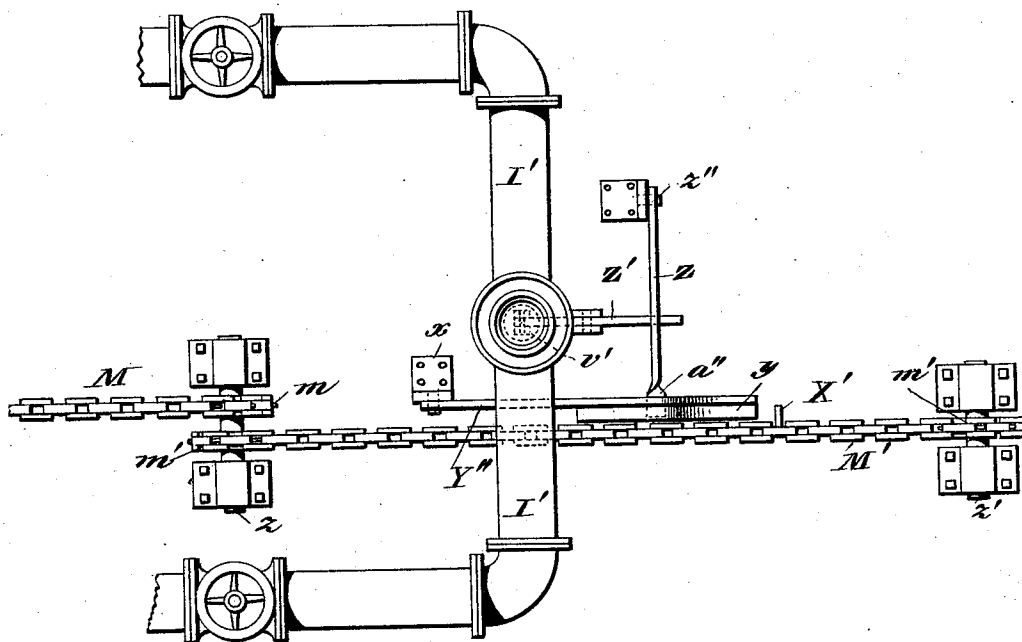
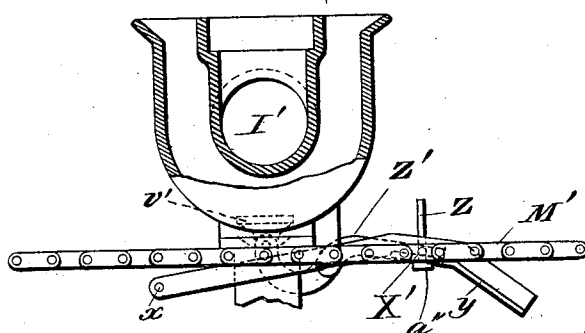


Fig. 16



Witnesses.

J. F. Colman
Alex. Scott

Inventors.

E. Ramsay & E.
E. Drey Spring,
By Horner & Horner,
Attys

UNITED STATES PATENT OFFICE.

ERSKINE RAMSAY AND ERNEST DREYSPRING, OF BIRMINGHAM, ALABAMA.

COAL AND MINERAL WASHER.

SPECIFICATION forming part of Letters Patent No. 579,840, dated March 30, 1897.

Application filed August 6, 1896. Serial No. 601,884. (No model.)

To all whom it may concern:

Be it known that we, ERSKINE RAMSAY and ERNEST DREYSPRING, citizens of the United States, residing in Birmingham, Jefferson county, Alabama, have invented certain new and useful Improvements in Coal and Mineral Washers, of which the following is a specification.

Our invention relates to coal and mineral washers, and more especially to mechanism for automatically operating the gate-valves and sludge-tank valves of such washing apparatus; and our chief object is to increase the efficiency of coal and mineral washers by providing mechanism for automatically operating the gate or slate-discharge valves of the washer-chamber and mechanism for automatically operating the valves of the sludge-tank commonly used in connection with such washers.

Our further object is to provide such a mechanism for the purpose defined which shall be simple in construction and capable of ready control, so that it can be thrown into and out of operative connection with a suitable driving shaft or power, as desired, and which shall be reliable in operation and all contributing to increase the speed and efficiency of operation of the washing apparatus.

With these general objects in view our invention consists in a novel mechanism and details thereof, as hereinafter described and claimed, with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a coal and mineral washer and sludge-tank, partly in section, with our invention applied thereto. Fig. 2 is a top plan view with the discharge-chutes removed for clearer illustration. Fig. 3 is a partly-sectional side elevation of the power-cylinders for operating the valves of the washer. Fig. 4 is a top plan view of the same. Fig. 5 is an enlarged detail side view of the tappet-chain for operating the controlling-valves of the power-cylinders. Fig. 6 is a sectional view of the power-cylinder valves, showing the four different positions assumed in operation. Fig. 7 is a vertical view on line 7 7, Fig. 3. Fig. 8 is a vertical sectional view on the line 8 8, Fig. 5. Fig. 9 is a sectional detail on line 9 9, Fig. 5. Fig. 10 is a detail of the tappet-chain. Fig. 11 is a partly-sectional side elevation of the lower part of the

sludge-tank, showing the valve-operating mechanism therefor. Fig. 12 is a vertical section on the line 12 12, Fig. 11. Figs. 13 and 14 are details of modifications. Fig. 15 is an enlarged top plan view of the sludge-tank valve-operating mechanism. Fig. 16 is a similar view to Fig. 11, showing the sludge-tank valve in its opened position.

In the drawings the same reference-characters relate to the same or corresponding parts in all the views, and our invention is illustrated therein as applied to a Ramsay washer, as shown in Letters Patent No. 528,803, dated November 6, 1894; but it is to be understood that the invention is capable of use in any other forms of coal-washer or analogous apparatus as well.

The letter A indicates the coal-washer, to which coal is fed through the chute B into the central feed-shell *a*, in which shell the stirrer-shaft C is rotated through the medium of the bevel-gear *c*, meshing with the bevel-gear *d* on the driving-shaft D, and from the coal-washer the clean coal is discharged through the chute G over the perforated bottom plates *g*, the water containing the fine sediment passing through said bottom plates down into the sludge-tank H, from which water is pumped through pipes I', by means of the pulsometers J or other suitable pumps, through the washer inlet-pipes I into the washer above the slate-chamber *a'*, whence it is discharged upwardly through the washer-chamber A, and from the slate-chamber extends the conveyer-pipe *b*. These parts are substantially the same as disclosed in the patent to Ramsay, above referred to, and need no further description here, as they form no part of the present invention.

We will now describe our invention constituting the mechanism for automatically operating the gate-valves of the washer-chamber, and, referring particularly to Figs. 1 and 2, the letter F indicates a shaft mounted in suitable bearings, which shaft is preferably driven from the main shaft C of the washer by a chain E, passing around and engaging the sprockets *c' f* on the shafts C and F, respectively, and near the lower end of the shaft F is a friction-wheel K, splined or otherwise longitudinally adjustable on the said

shaft F, which wheel is adapted to turn in frictional contact with a larger friction disk or wheel L, mounted upon a horizontal shaft *l*, the relative diameters of the friction-wheel K and the friction-disk F being such as to enable the counter-shaft *l* to be driven at any desirable speed by the simple adjustment of the friction-wheel K up or down on its shaft, whereby the speed of rotation of the disk L is readily varied according as the radial distance of the line of contact or engagement between the two wheels K and L is varied.

Mounted upon the shaft *l* is a sliding half-clutch *l'*, operated by lever N, by means of which the shaft *l* may be clutched to the shaft *l''*, carrying the other half of the clutch fixed thereon and journaled in suitable bearings in alinement with the shaft *l*, whereby motion may be transmitted to said shaft *l''* when desired. Upon the shaft *l''* is mounted a sprocket-wheel *o*, transmitting motion to a chain O, passing around a sprocket-wheel P, journaled in suitable bearings, preferably located on the opposite side of the slate-chamber *a'*. The said gate-valves A' A'' are preferably connected directly to pistons *t*, reciprocating in cylinders S, by means of the piston-rods T, as shown more clearly in Fig. 3. These cylinders are preferably supported by turnbuckle-rods *q*, attached to the washer-chamber or washer structure, so that the said cylinders and piston-rods may be adjusted in alinement with the gate-valves. Each cylinder is provided with ports or passages for the inlet and discharge of motive fluid at the opposite ends thereof, the said ports being connected to a four-way valve-chamber U by means of pipes *s'''*, in which chamber is mounted a four-way controlling-valve *u*, which controls the admission of motive fluid to said cylinder through the supply-pipe *s*, leading from any suitable source, and the exhaust from said cylinder.

By the use of the term "motive fluid" we intend to include steam, air, gas, and water, such as in common use as motive fluids, and for convenience we will hereinafter describe our invention as utilizing steam as the motive fluid, it being understood that this term includes any form of motive fluid that may be found desirable.

Mounted upon the stems of the four-way valves *u* are star-wheels Q Q' for the upper and lower cylinders, respectively, which star-wheels have their arms projecting in the path of the tappet-arms X, arranged at suitable intervals on the links of the chain O, which we will hereinafter term the "tappet-chain." This chain, as seen more clearly in Figs. 5 and 10, is provided with one or more sets of four tappets X, which are relatively so arranged on the chain that the four-way cock or valve *u* of the upper cylinder may be operated by the turning of the star-wheel Q as the several tappets X successively come in contact with the arms of the star-wheels, while the tappet-chain is moving in the di-

rection of the arrow and in such manner that the steam may be admitted to the cylinder S and exhausted therefrom on one side of the piston *t* and then directed to the other side of said piston, whereby the valve A' may be opened and then closed to permit the slate and other impurities to fall from the washer-chamber into the slate-chamber between the two valves, a further movement of the chain causing the same operation to be performed in connection with the lower cylinder, its four-way valve, and gate-valve A''.

The operation of the tappets for controlling the valves of the upper and lower cylinders for causing the said valves to be opened and closed may be better understood by reference to Figs. 5 and 6, where it will be seen that two sets of tappets of four tappets each are shown on the tappet-chain O and numbered 1, 2, 3, and 4, the four positions of the four-way valve *u* being indicated by the numbers 1 2 3 4, Fig. 6, in which No. 1 is the position which the valve assumes when the steam is cut off from the cylinder, which position is due to the movement of the tappet 1 against the star-wheel Q on the upper run of the chain O. No. 2 indicates the position the valve assumes when the tappet 2 has engaged the star-wheel and turned the valve from the position 1 to 2, thus admitting steam into the end of the cylinder nearest the washer and causing the piston to move and open the gate-valve A'. As the chain continues to move and brings the tappet No. 3 into contact with the star-wheel the latter is turned so that the valve *u* assumes the position 3, thereby cutting off the steam, and a further movement of the tappet-chain causes the tappet 4 likewise to engage the star-wheel, thus turning the valve *u* to position No. 4, thereby exhausting the steam from the end of the cylinder nearest the washer and admitting the steam to that end farthest from the washer and causing the piston to close the upper gate-valve after the slate-chamber is filled with material from above, the movements of the valve being thus intermittently effected through the intermittent operation of the cylinder-controlling valve. The same cycle of operation is repeated on the lower valve through the medium of another set of tappets on the lower run of the tappet-chain O, or the same set of tappets, if desired, may be utilized to operate both valves, the two gate-valves being thus alternately actuated by their respective operating mechanisms.

In order to prevent the chain O from buckling while the tappets are in engagement with the star-wheels, we preferably provide guideways or strips for said chain extending a short distance on each side of the star-wheels, and in the drawings we have illustrated one convenient form of guideways for this purpose, which consists of grooved guide-strips V V', that are mounted upon suitable brackets or supports carried by frames Y, extending upwardly on both sides of the star-wheels, so

that as the chain passes the star-wheels it is held against lateral strains by the grooved guideways and prevented from buckling as the pressure of the tappet is exerted upon the star-wheels.

In order to prevent the too sudden operation of the gate-valves $A' A''$ by the operating pistons and to cushion the movements of the same, we preferably provide oil-cushion cylinders or dash-pots S' in alinement with the steam-cylinder S , in which cylinders S' are pistons t' , mounted upon the piston-rod T , if desired, or connected with the steam-pistons t by separate piston-rods. The opposite ends of the oil-cylinders S' are connected through two passages therein by pipes $s' s''$, which are provided with plugs p , through which the cylinders S' may be filled with oil or other fluid. In the pipes $s' s''$ are regulating-valves p'' by which the oil-passages from one end of the cylinders to the other may be enlarged or restricted, as desired, according to the amount of cushioning and speed of movement of the gate-valves required, relief-valves p' being provided for the purpose of discharging the cylinders or relieving the same, according to necessity. These oil-cylinders are preferably connected to the steam-cylinder by intermediate castings having upper and lower U-shaped castings w , forming receptacles for water of condensation and oil, the edges of which extend above the piston-rods and stuffing-boxes of the cylinders, to the bottoms of which U-shaped receptacles are connected pipes W , by which arrangement the piston-rods are kept constantly oiled by the waste oil which remains always on the top of the water of condensation that accumulates in the receptacle w , from which receptacle the excess water of condensation is automatically drawn off by the pipes W .

We will now describe the mechanism for automatically operating the sludge-tank valves, which mechanism is preferably operated from the same shaft that controls the operation of the gate-valves of the washer, so that when the slate or other heavy impurities are automatically discharged from the washer the finer sediment, such as iron pyrites and the like, will be discharged from the sludge-tank, in the bottom of which the said impurities accumulate.

Upon the shaft l is a sprocket-wheel m , transmitting motion by means of the chain M to a similar sprocket-wheel m , mounted on the shaft z , journaled in suitable bearings near the sludge-tank, upon which shaft is also mounted a sprocket-wheel m' , transmitting motion through chain M' to another sprocket-wheel m' , mounted on a shaft z' , located on the opposite side of the tank from the shaft z . This chain is provided with a tappet X' , extending from one side thereof.

The sludge-tank valve v' opens inward and rests upon one end of its operating-lever Z' , pivotally supported by the tank, the free end of which lever extends slightly beyond the

lower portion of the sludge-tank to one side of the sprocket-chain M' , and pivoted at z'' is a lever Z , extending at right angles to the lever Z' and resting upon the same, as shown in Figs. 2 and 12, the outer end of which lever Z is preferably turned down in a horizontal plane at a'' , upon which flattened extension rests a cam-lever Y'' , fulcrumed at x , the other end of which is provided with a horizontal cam-flange y in the path of the tappet X' , and over which the said tappet is adapted to ride during the movement of the chain M' . By this construction it will be seen that as the chain M' moves the tappet X' rides up the inclined flange y of the lever Y'' , depressing the same, thereby pushing the lever Z downward, which in turn depresses the free end of the lever Z' , thus raising the valve v' and discharging the fine sediment from the sludge-tank.

It will be understood that while we have described what we consider to be the preferable form of our invention various changes may be made in the details thereof without departing from the spirit and scope thereof, as we believe that we are the first to provide any means for automatically operating the gate-valves of a coal and mineral washer, as well as the first to provide means for operating automatically sludge-tank valves.

Instead of applying the two shafts $l l'$ it is obvious that a single shaft may be used, in which case any well-known form of clutch may be applied to the hub of the disk L , which would be loosely mounted on its shaft, as shown in Fig. 13, or the sprocket-wheel f may be loosely mounted on the shaft F and provided with a clutch for sliding up and down on the shaft F , so as to lock said wheel to and unlock it from the shaft F , as shown in Fig. 14, all of which variations are to be understood as coming within the scope of our invention, as they embody well-understood mechanical movements.

It is also obvious that the substitution of other forms of motive cylinders for the one shown will still be within our invention, which includes the use of rotary and other forms of engines for operating the gate-valves, as well as the reciprocating engines shown, and in such case the connection between the engine and valves can be made by any one skilled in the art without the exercise of invention, while other forms of controlling-valves may be employed in the place of the rotary valves, if found desirable, and the gate-valves may be operated automatically from the washer-shaft by belting or gearing in a similar manner to the sludge-tank valves when circumstances render it desirable.

While we have shown and described chains and wheels for actuating the valve mechanism, it is obvious that belts or equivalent gearing may be employed, should circumstances make it desirable to do so, without departing from our invention.

Whenever it is found desirable to operate only one of the gate-valves, it is to be understood that one cylinder and its operating parts may be omitted or thrown out of action without departing from our invention, and in using "valves" in the claims we desire to be understood as covering either one or more valves, as desired.

We claim as our invention—

1. In a coal and mineral washer, the combination with the washer-chamber and the gate-valves therein, the sludge-tank and discharge-valve therefor, of mechanism controlled by a driven part of the apparatus for automatically and alternately operating the gate-valves of the washer-chamber, and mechanism controlled by the driven part of the apparatus, before mentioned, for automatically opening and closing the said sludge-tank valve, substantially as described.

2. In a coal and mineral washer, the combination with the washer-chamber, the stirrer-shaft, and the gate-valves in said chamber, of a counter-shaft driven from the stirrer-shaft of the washer, motive-power cylinders having pistons therein connected to said gate-valves, controlling-valves for said cylinders, and connections between said counter-shaft and the controlling-valves of the cylinders, for causing the pistons therein to automatically and alternately operate the gate-valves of the washer, substantially as described.

3. In a coal and mineral washer, the combination with the washer-chamber and the gate-valves therefor, of motive-power cylinders, pistons therein connected with said valves, and valves for controlling the motive fluid to and from said cylinders, and mechanism for alternately and automatically operating the said cylinder-valves, whereby the said gate-valves may be automatically opened and closed by the movements of the pistons in said cylinders, substantially as described.

4. In a coal and mineral washer, the combination with the washer-chamber and gate-valves therein, of the motive-power cylinders and pistons therein connected to said valves, the controlling-valves for said cylinders, and mechanism controlled by a moving part of the washer for operating said valves automatically to cause the pistons to automatically open and close the gate-valves, substantially as described.

5. In a coal and mineral washer, the combination with the washer-chamber and gate-valves therein, of the motive-power cylinders and pistons therein connected to the valves, controlling-valves for said motive-power cylinders, and mechanism controlled by a moving part of the washer, for automatically operating said valves to cause the pistons to open and close the gate-valves alternately, substantially as described.

6. In a coal and mineral washer, the combination with the washer-chamber, and the gate-valve thereof, of a vertical rotating shaft having a friction-wheel thereon and operated by

a driving part of the washer, a horizontal shaft having a friction-disk mounted thereon in contact with the face of said wheel, a second shaft in alinement with the horizontal shaft and a clutch mechanism for locking the two together, a tappet-chain driven by the second shaft, motive-power cylinders having pistons connected directly to the valves of the washer-chamber, and controlling-valves for said cylinders operated by the tappet-chain to cause the washer-valves to be automatically operated, substantially as described.

7. In a coal and mineral washer, the combination with the washer-chamber, the driving-shaft therefor, and the valves therefor, of motive-power cylinders having pistons therein connected to said valves, controlling-valves for said cylinders, and connections between the driving-shaft of the washer and said controlling-valves for automatically operating said valves to cause the gate-valves to be opened and closed, substantially as described.

8. In a coal and mineral washer, the combination with the washer-chamber, stirrer-shaft, and gate-valves therein, of a shaft having a friction-wheel mounted thereon, means for driving the shaft directly from the stirrer-shaft, a counter-shaft having a friction-disk thereon in engagement with the friction-wheel of the driving-shaft, power-operating mechanism connected to the valve for moving the same, and connections between the disk and power-operating mechanism for automatically controlling the movements of the same to operate the valves, whereby the gate-valves are automatically and alternately opened and closed to periodically discharge the impurities from the washer, without interrupting the operation of said washer, substantially as described.

9. In a coal and mineral washer, the combination with the washer-chamber, and gate-valves therein, of motive-power cylinders provided with controlling-valves, pistons in said cylinders connected to the gate-valves, a shaft driven by an operating part of the apparatus, a counter-shaft, operating connections intermediate the two shafts, and a tappet-chain operated from the counter-shaft, and adapted to operate the controlling-valves to admit motive-fluid to and exhaust it from the cylinders, substantially as described.

10. In a coal and mineral washer, the combination with the washer, the gate-valves therein, of motive-power cylinders having pistons therein connected with the gate-valves, a rotating shaft and a counter-shaft driven thereby, controlling-valves for the cylinders, and a tappet-chain adapted to operate said valves automatically and connections between said tappet-chain and counter-shaft, substantially as described.

11. In a coal and mineral washer, the combination with the washer-chamber, the gate-valves therein, of motive-power cylinders having pistons therein connected with said valves, rotary controlling-valves for said

cylinders having star-wheels mounted on the stems thereof, a tappet-chain with tappets thereon so spaced as to actuate said star-wheels intermittently and mechanism for driving said chain, substantially as described.

12. In a coal and mineral washer, the combination with the washer, the gate-valves therein, of the motive-power cylinders having operating connections with the gate-valves, controlling-valves for said cylinder provided with star-wheels on the stems thereof, a chain having tappets extending from the sides thereof and arranged to actuate the star-wheels as the chain moves, a shaft for driving said chain, a counter-shaft having a friction-disk thereon, and clutch mechanism for connecting the two shafts together, a driving-shaft having a friction-wheel thereon in engagement with said friction-disk, and means for driving said shaft, substantially as described.

13. In a mechanism for operating the gate valve or valves of a washing apparatus, the combination of the gate valve or valves, and the motive-power cylinder or cylinders for operating the same, of a tappet-chain for operating the controlling valve or valves of the cylinder or cylinders, and grooved guideways arranged near the cylinders through which the chain is confined to travel, substantially as and for the purpose described.

14. In a coal and mineral washer, the combination with the washer-chamber, the gate-valves therein, and the main driving-shaft, of the power-cylinders having pistons therein connected to the gate-valves, the vertical driving-shaft driven from the main shaft, counter-shaft and connections between said shaft and the controlling-valves of the cylinders, with adjustable connections between the driving-shaft and the counter-shaft for driving the latter at different speeds, substantially as described.

15. The combination with a gate-valve of a mineral-washing apparatus, of a motive-power cylinder, having a piston therein for operating said valve, a fluid-cushioning cylinder having a piston therein connected by a piston-rod to the motive-power piston, a U-shaped casting forming a receptacle for wa-

ter and oil connecting said cylinders, and a pipe connected to the bottom of said receptacle and extending above the piston-rod, whereby the said rod is kept oiled by the oil on top of the water in the receptacle, substantially as described.

16. The combination with the sludge-tank and the discharge-valve therein, of a lever for operating said valve, a driven shaft and means for driving the same, a tappet-chain having a tappet thereon and operated by said shaft, a second lever fulcrumed near the tank and having its free end engaging the valve-operating lever, and a cam-lever fulcrumed near the tank and engaging said second lever and located in the path of the tappet on the chain, substantially as described.

17. The combination with the sludge-tank and the discharge-valve therein, of a lever for operating the valve, a driven shaft, and means for driving the same, a chain carrying a tappet extending from one side thereof, a lever fulcrumed near the tank and having an inclined flange extending from the side near its free end in the path of said tappet, and connections between said lever and valve-operating lever, substantially as described.

18. The combination with the coal and mineral washer and driving-shaft therefor, of a sludge-tank having a discharge-valve thereon, a driving-shaft with connections between the same and the driving-shaft of the washer, a tappet-chain operated by said driven shaft and having a tappet extending from the side thereof, a lever fulcrumed near the tank and provided with a cam-flange near its free end located in the path of said tappet, and connections between said lever and the discharge-valve for operating the latter, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ERSKINE RAMSAY.

ERNEST DREYSPRING.

Witnesses:

C. E. MORRIS,
R. W. CECIL.