

Aug. 23, 1927.

N. D. LEVIN

1,639,741

DISLODGING MECHANISM

Original Filed Aug. 13, 1920 4 Sheets-Sheet 1

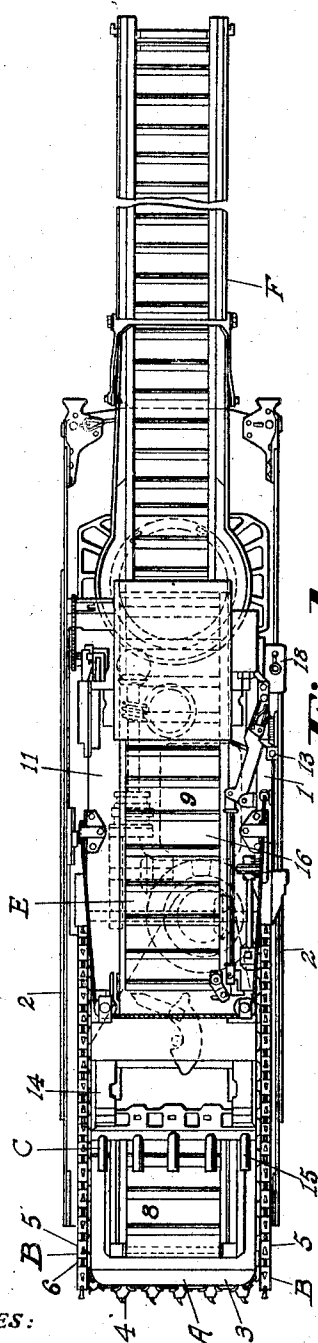


Fig. 1.

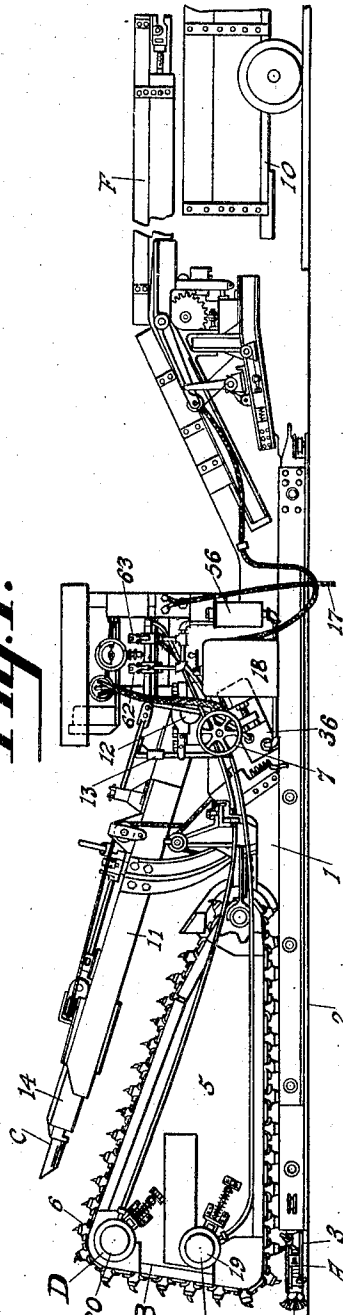


Fig. 2.

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4 Sheets-Sheet 2

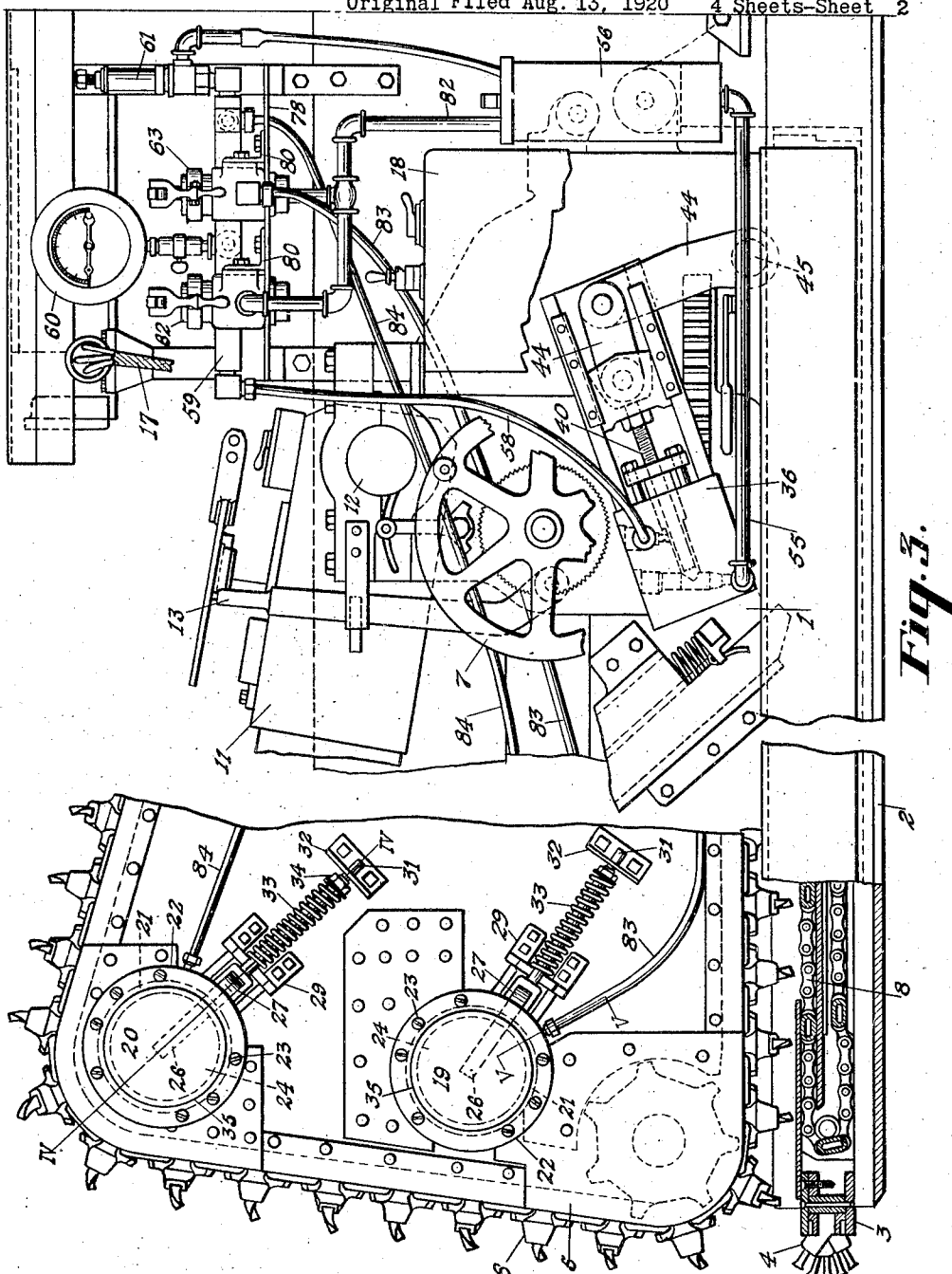


Fig. 3.

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DISLODGING MECHANISM

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4 Sheets-Sheet 3

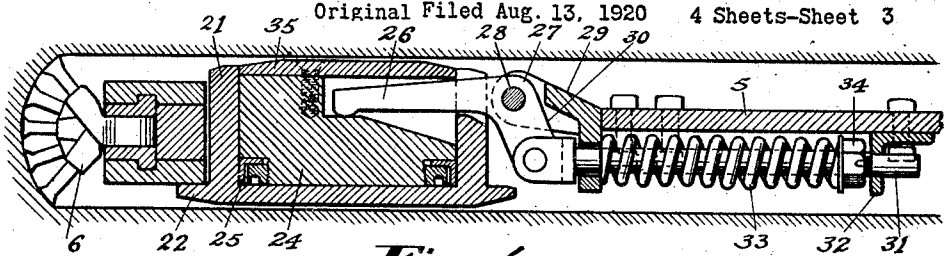


Fig. 4.

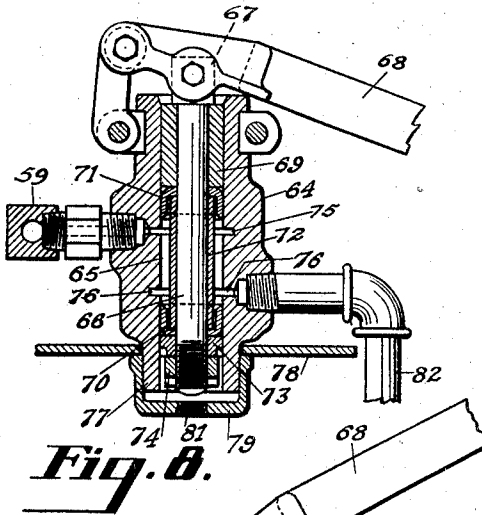


Fig. 6.

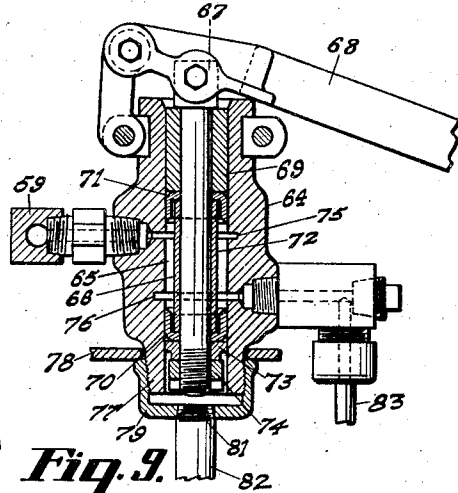


Fig. 9.

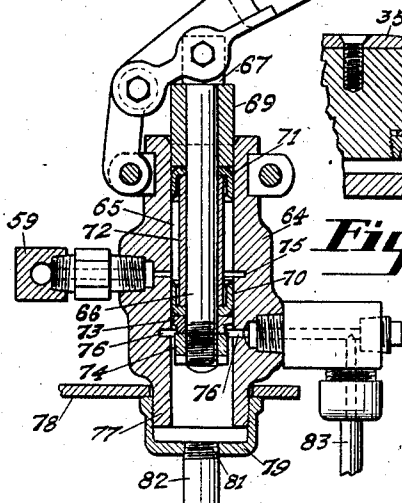


Fig. 10.

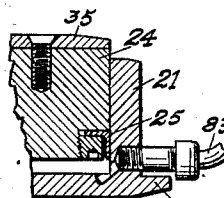


Fig. 5.

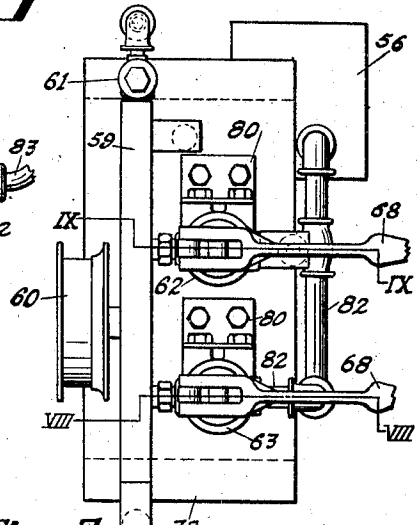


Fig. 7.

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DISLODGING MECHANISM.

Original Filed Aug. 13, 1920 4 Sheets-Sheet 4

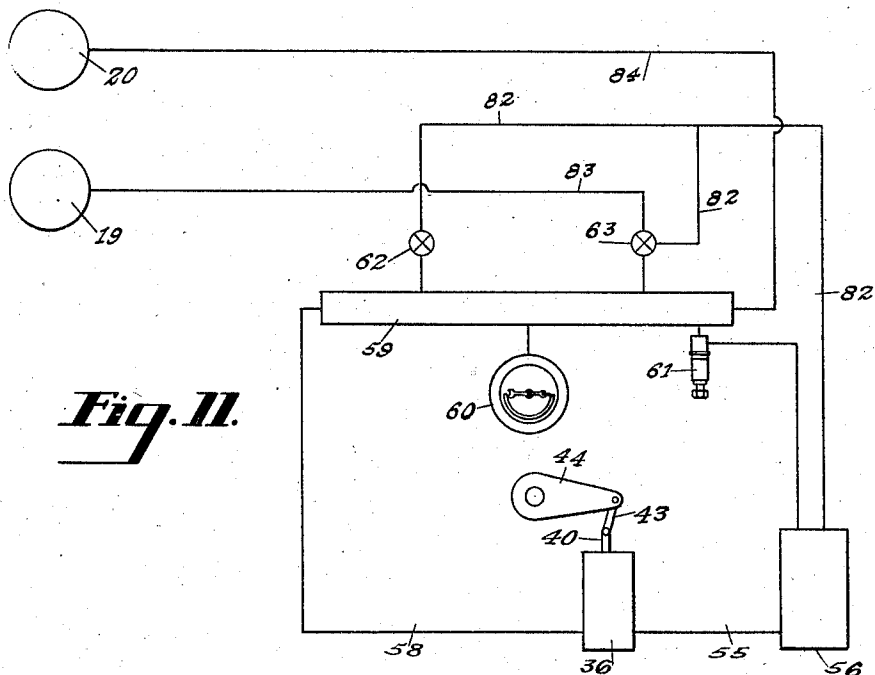


Fig. 11.

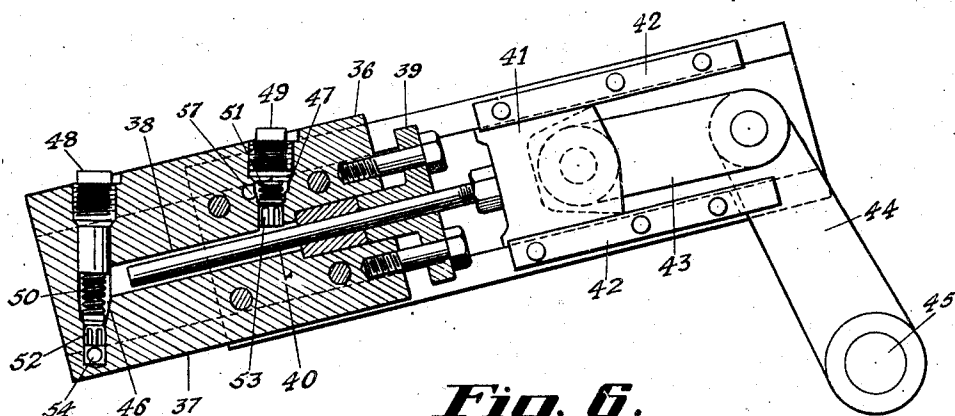


Fig. 6.

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UNITED STATES PATENT OFFICE.

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DISLODGING MECHANISM.

Application filed August 13, 1920, Serial No. 403,376. Renewed January 4, 1926.

The present invention relates to certain new and useful improvements in dislodging mechanism adapted to use with mining machines of the type comprising devices for undercutting the coal, breaking it down and loading it into cars for transportation from the mine.

In my co-pending application, Serial No. 184,946, filed August 7th, 1917, is disclosed a mining machine having simultaneous acting cutting devices arranged to produce correlated horizontal and vertical kerfs in the body of the vein, and having reciprocating pick mechanism and hydraulically actuated pressure exerting mechanism adapted to co-operate with said kerf cutting mechanism to dislodge the coal.

It is the especial object of this invention to provide, in a machine of the class described, an improved arrangement of parts whereby the pressure exerting mechanism may more effectively co-operate with the pick mechanism to dislodge the coal.

A further object is to provide improved hydraulically actuated pressure exerting devices of simple and durable construction adapted to the purpose above described.

A further object is to provide improved mechanism for controlling the operation of said pressure exerting devices.

The means by which I attain these objects are fully set forth in the following specification and illustrated in the accompanying drawings of which—

Fig. 1 is a general plan view of a mining machine adapted to the purposes of this invention.

Fig. 2 is a side elevation of the machine illustrated in Fig. 1.

Fig. 3 is a fragmentary side elevation on an enlarged scale showing in detail the devices of this invention.

Fig. 4 is a section taken along the line IV—IV of Fig. 3.

Fig. 5 is a section taken along the line V—V of Fig. 3.

Fig. 6 is a longitudinal vertical section of the hydraulic pump which actuates the pressure exerting devices.

Fig. 7 is a fragmentary plan view of the pressure controlling mechanism.

Fig. 8 is a section taken along the line VII—VII of Fig. 7.

Figs. 9 and 10 are sections taken along the line IX—IX of Fig. 7.

Fig. 11 is a diagram illustrating the connections between the several elements of the hydraulic system of coal dislodging mechanism.

Like numerals refer to similar parts in the several figures.

Stated very briefly the mining machine to which my invention relates comprises six principal parts. These are the undercutting mechanism, indicated in Figs. 1 and 2 by the letter "A"; the vertical shearing devices "B" and "B"; the reciprocating pick element of the dislodging mechanism "C"; the pressure exerting elements of the dislodging mechanism "D"; the primary or receiving conveyor "E" and the secondary or loading conveyor "F".

These parts are co-operatively connected together and mounted upon a main frame 1 which is supported upon and slidably movable in a pan or shoe 2 which rests directly upon the mine floor. Supported upon the main frame 1 is a horizontally extending cutter frame 3 upon the edges of which travel the cutter chains 4 which constitute the undercutting mechanism "A". Supported on the main frame 1, at either side of the machine, are two vertically extending cutter frames 5 upon the edges of which travel the cutter chains 6 which constitute the vertical shearing cutters "B". Feeding mechanism, not shown in the drawings, is mounted upon the main frame 1 to move it relative to the supporting pan 2 and cause the cutters "A" and "B" to engage the coal to cut it. These feeding devices are arranged to be controlled through the agency of the hand wheel 7 which is positioned at one side of the machine convenient to the hand of the operator.

The receiving conveyor "E" may be of any preferred type suited to the purposes intended, and has a forward horizontal receiving portion 8 and a rearward inclined elevating portion 9. The receiving portion 8 is positioned within the bounding planes of the undercutter "A" and is carried with it into the kerf to be in position to receive the coal as it is broken down. The inclined portion 9 of the conveyor "E" elevates the broken coal and discharges it into the loading conveyor "F" by which it is transferred to a car 10 suitably positioned at the rear of the machine.

The pick mechanism "C" comprises two parallel guide members 11 supported by

trunnions 12 in journal bearings formed on the main frame, and these guide members are adapted to be upwardly and downwardly oscillated by mechanism which is controlled through the hand lever 13. Longitudinally
 5 slidable in the guide members 11 is a frame 14 which carries a plurality of pick tools 15 adapted, when said frame is reciprocated longitudinally of the guide members 11, to
 10 engage the mine wall above the undercutter "A" and between the shearing cutters "B" to break down the coal upon the receiving conveyor "E". Power for the actuation of the several elements of the machine is supplied by a suitable electric motor 16 which
 15 derives its power from any convenient source of electric supply through a flexible insulated conductor cable 17. The motor 16 is controlled by means of a suitable electric
 20 controller 18 positioned at the side of the machine convenient to the hands of the operator.

The pressure exerting element "D" of the dislodging mechanism comprises two hydraulic rams 19 and 20 attached to the shearing cutter frame 5 at one side of the machine, preferably the left hand side. These rams are adapted to exert pressure against the partly severed mass of coal above the receiving conveyor to produce a distortion of the mass which tends to shatter the coal along the planes of its natural cleavage and render it more easily broken by the pick mechanism. Each of the rams 19 and 20
 35 comprises a cylinder 21 which extends through an aperture of the cutter frame 5 and is provided with a flange 22 by which it is secured to said cutter frame by suitable machine screws 23. Longitudinally slidable
 40 in the cylinder 21 is a plunger 24 the inner end of which is fitted with a cup leather packing 25 in the manner common in hydraulic ram practice. The outer end of the plunger 24 is engaged by the longer arm 26 of the bell crank 27 which is pivotally supported by the pin 28 in a casting 29 attached to the cutter frame 5. The shorter arm 30
 45 of the bell crank 27 is connected to a rod 31 slidable in apertures of the casting 29 and of the guide angle 32. Surrounding the rod 31 is a compression spring 33 which is compressed between the casting 29 and the nut 34 threaded to the rod 31. By the pressure of the spring 33 the bell crank 27 is rotated to
 50 press the plunger 24 inwardly of the cylinder 21. A cover plate 35 attached to the outer end of the plunger 24 affords a fair bearing for the said plunger against the surface of the coal and prevents clogging the
 60 parts with broken coal.

Fluid pressure for the actuation of the rams 19 and 20 is supplied by a pump 36 which may be of any preferred construction suitable to the purposes of the invention.
 65 For purposes of illustration I have shown a

pump comprising a body portion 37 in which is formed a pump chamber 38 provided with the customary packing gland 39 through which the pump plunger 40 is reciprocable. The pump plunger 40 is attached to a cross
 70 head 41 slidable in guide ways 42, and connected by a link 43 with the rocker arm 44. The rocker arm 44 is mounted upon a shaft 45 supported in bearings of the main frame, and actuated from the motor 16 through
 75 gearing not shown in the drawings. Valve chambers 46 and 47 communicate with the pump chamber 38 and are closed outwardly by screw plugs 48 and 49. Compression
 80 springs 50 and 51 abut against the plugs 48 and 49 to hold the valves 52 and 53 to their seats. An aperture 54 connects the valve chamber 46 with a tube 55 through which
 85 water may flow from the supply tank 56, and an aperture 57 connects the valve chamber 47 with a tube 58 extending to the manifold 59 of the controlling mechanism. A suitable pressure gage 60 and a safety valve 61
 90 are connected with the manifold 59 for the purposes for which such devices are commonly used.

The control valves 62 and 63 may be of any suitable type. In the drawings I have shown a preferred construction comprising a body portion 64 having a longitudinally
 95 bored cylinder 65 in which is mounted for reciprocation a plunger rod 66. The plunger rod 66 is formed with a square head 67 which is pivotally connected with the operating lever 68. Abutting against the head
 100 67 is a cylindrical guide collar 69 which slidably fits in the cylinder 65. Two oppositely disposed cup leather packings 70 and 71, separated by a spacing sleeve 72, are clamped between the guide collar 69 and a
 105 second guide collar 73 by the lock nut 74 screw threaded to the plunger rod 66. An inlet port 75 connects the cylinder 65 with the manifold 59 and a similar port 76 connects with suitable tubing to afford an outlet from
 110 the cylinder 65. The proportions and arrangement of the parts are such that when the plunger is in its uppermost position, as illustrated in Fig. 10, the cup leather 70 seals the cylinder 65 between the inlet and
 115 outlet ports and the cup leather 71 seals the cylinder above the inlet port, thereby preventing the flow of water through the valve. When the plunger is in its lowermost position, as illustrated in Figs. 8 and 9, the cup
 120 leather 70 seals the cylinder below the outlet port 76 and the cup leather 71 seals the cylinder above the inlet port 75 leaving a fair passage for the water through the valve from inlet to outlet. An extension 77 of
 125 the valve body 64 projects through an aperture in the shelf 78 upon which the controlling mechanism is supported, and is clamped in place by a cap 79 screw threaded to said extension. Further rigidity is given
 130

to this support by the angle bracket 80 attached to the valve body and the shelf by suitable cap screws. A drain aperture 81 is provided in the cap 79 to allow the escape of water which finds its way below the plunger. The outlet port 76 of the valve 62 is connected with the supply tank 56 by a tube 82, a branch of which connects with the drain aperture 81 of the valve 63. A tube 83 extends from the outlet port of the valve 63 to the ram 19, and a similar tube 84 connects the ram 20 with the manifold 59. During the entire operation of the machine the pump 36 is normally actuated and the valve 62 normally stands open, as illustrated in Fig. 8, to allow the free return of water to the supply tank, thereby preventing the generation of pressure in the system.

During the operation of the machine when the kerf cutters have been advanced a sufficient distance into the coal, the valve 62 will be closed to prevent the escape of water from the manifold 59 to the supply tank, and the valve 63 will be opened to allow water to flow to the lower ram 19. The continuous operation of the pump 36 forces the water into the cylinders 21 of both rams to push their plungers 24 outwardly until they contact with the right hand side of the kerf. The elasticity of the cutter frame 5 allows the cylinders 21 to move towards the left until they contact with the left hand side of the kerf. The pressure exerted by the rams 19 and 20 tends to push the partly severed coal towards the right, producing a strain in the mass which opens the cleavage seams, thereby materially assisting the pick mechanism to break it down. Frequently the lower portion of the coal breaks off before the upper part has become sufficiently shattered, and the valve 63 will be closed to confine the action of the pump to the upper ram 20. When the valve 63 is closed the pressure of the spring 33 acting through the bell crank 27 upon the plunger 24 causes the water to return from the ram 19 through the tube 83, drainage aperture 81 and drainage tubes 82 82 to the supply tank. After the upper portion of the coal has been dislodged the valve 62 will be again opened to permit the return of the water from the ram 20 to the supply tank, and to reestablish the short circuit around the pump.

What I claim is—

1. In a mining machine, the combination with a cutter frame, a cutter chain carried by said cutter frame and adapted to form a kerf in the mine wall, a transversely extending cylinder attached to said cutter frame and adapted to be carried therewith into said kerf, a plunger movable longitudinally of said cylinder, hydrostatic means to force said plunger outwardly of said cylinder, and resilient means outside of said

cylinder arranged to force said plunger inwardly of said cylinder.

2. In a mining machine, the combination with a cutter frame, a cutter chain carried by said cutter frame and adapted to form a kerf in the mine wall, a transversely extending cylinder attached to said cutter frame and adapted to be carried therewith into said kerf, a plunger movable longitudinally of said cylinder, hydrostatic means to force said plunger outwardly of said cylinder, a spring acting transversely of said cylinder, and means actuated by said spring to move said plunger inwardly in said cylinder.

3. In a mining machine, the combination with a cutter frame, a cutter chain carried by said cutter frame and adapted to form a kerf in the mine wall, a transversely extending cylinder attached to said cutter frame and adapted to be carried therewith into said kerf, a plunger movable longitudinally of said cylinder, hydrostatic means to force said plunger outwardly of said cylinder, and a spring actuated lever pivotally attached to said cutter frame and arranged to force said plunger inwardly of said cylinder.

4. In a mining machine, the combination with a cutter frame, a cutter chain carried by the cutter frame and adapted to form a kerf in the mine wall, a transversely extending cylinder attached to said cutter frame and adapted to be carried therewith into said kerf, a plunger movable longitudinally in said cylinder, hydrostatic means to move said plunger outwardly of said cylinder, a bell crank pivotally mounted upon said cutter frame and having one of its arms engaging said plunger, and a spring acting upon the other arm of said bell crank to force said plungers inwardly of said cylinder.

5. In a mining machine, the combination with a kerf cutter adapted to form a kerf in a mine wall, two hydraulic rams mounted upon said kerf cutter and adapted to be carried therewith into said kerf to exert pressure transversely thereof, a pump, a conductor connecting said pump with one of said rams, a branch conductor connecting said first mentioned conductor with the second ram, a second branch conductor arranged to short circuit said pump, and valves in said branch conductors to control the flow of fluid therethrough to cause the actuation of one or both of said rams.

6. In a mining machine, the combination with a cutter frame, a cutter chain upon the frame adapted to form a kerf in the mine wall, a plurality of chambers in said cutter frame, pistons in said chambers, means for introducing motive fluid to one or more of said chambers for the projection of said pistons to exert pressure upon the walls of said kerf, and resilient means external of said

chambers acting in opposition to said motive fluid to retract said pistons.

7. In combination, a hydraulic jack adapted to enter transversely in a kerf formed in a coal face, means for supplying a pressure medium to said jack for actuating same, a power storing device external to said jack and energized upon the actuation of the latter, said device serving to retract said jack subsequent to the working movement of the latter.

8. In a mining machine, in combination, a kerf-forming tool, a support therefor, a hydraulic jack transversely disposed relative to the working line of said tool and to the rear of same, a power-storing device mounted externally to said jack upon the tool support and energized upon the actuation of the latter, said device effecting the retraction of said jack subsequent to the working movement of the latter.

9. In a mining machine, in combination, a kerf-forming tool, a support therefor, a hydraulic jack transversely disposed relative to the working line of said tool and to the rear of same, a power-storing device mounted externally to said jack and a connection between said jack upon the tool support, and said device whereby the latter is energized upon the actuation of the former and said device effects the retraction of said jack subsequent to the working movement of the latter.

10. In a mining machine, in combination, a kerf-forming tool, a support therefor, a

hydraulic jack transversely disposed relative to the working line of said tool and to the rear of same, a power-storing device mounted externally to said jack and a pivoted lever connecting said jack upon the tool support, and said device whereby the latter is energized upon the actuation of the former and said device effects the retraction of said jack subsequent to the working movement of the latter.

11. In an apparatus of the class described, the combination with two hydraulic rams, of a pump, conductors forming a circuit around said pump, a control valve in said circuit, a pair of branch conductors in connection with said circuit intermediate said pump and valve and in connection with said rams, respectively, and a valve in one of said branch connectors.

12. In an apparatus of the class described, the combination with two hydraulic rams, of a pump, conductors forming a circuit around said pump, a control valve in said circuit, a pair of branch conductors in connection with said circuit intermediate said pump and valve and in connection with said rams respectively, one of said branch conductors having a further connection with said circuit intermediate said control valve and said pump, and a valve for controlling the connection of this branch conductor with the circuit.

In testimony whereof I affix my signature.

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