

April 7, 1942.

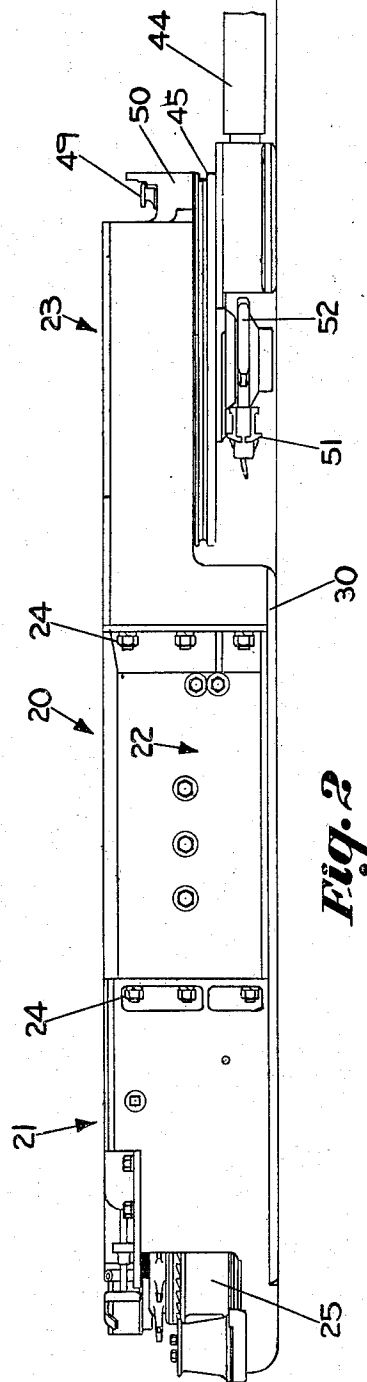
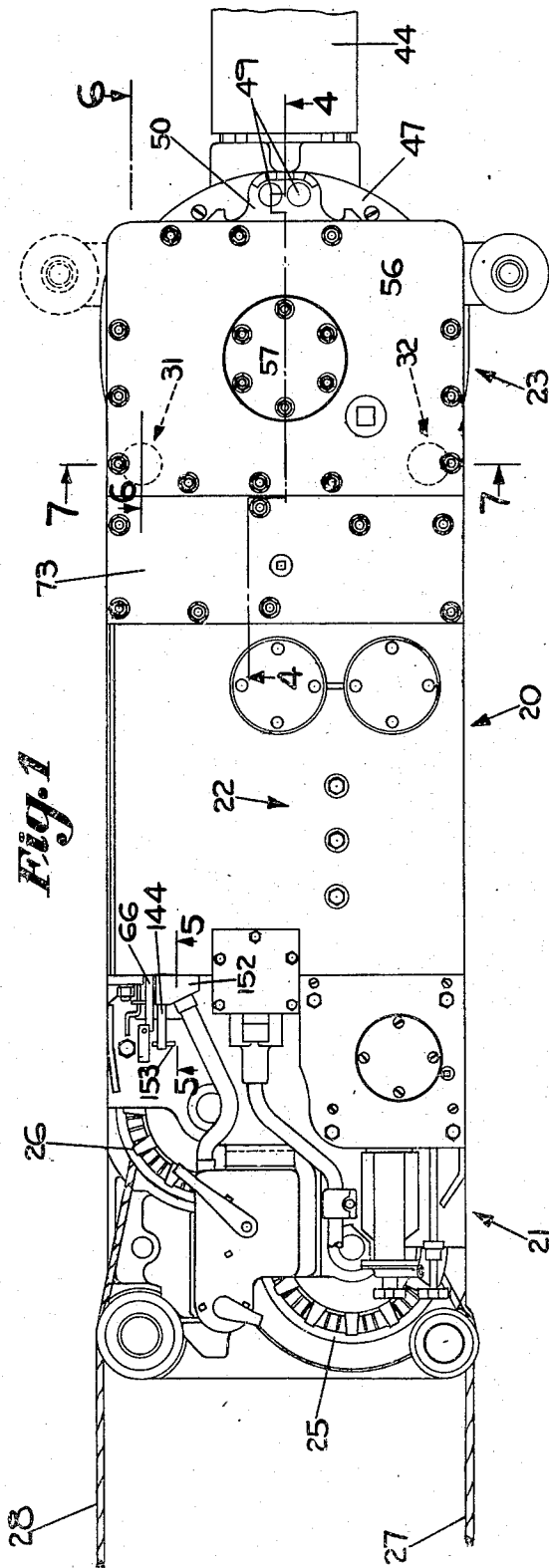
R. K. JEFFREY

2,278,656

MINING MACHINE

Filed June 21, 1938

7 Sheets-Sheet 1



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2,278,656

MINING MACHINE

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7 Sheets-Sheet 2

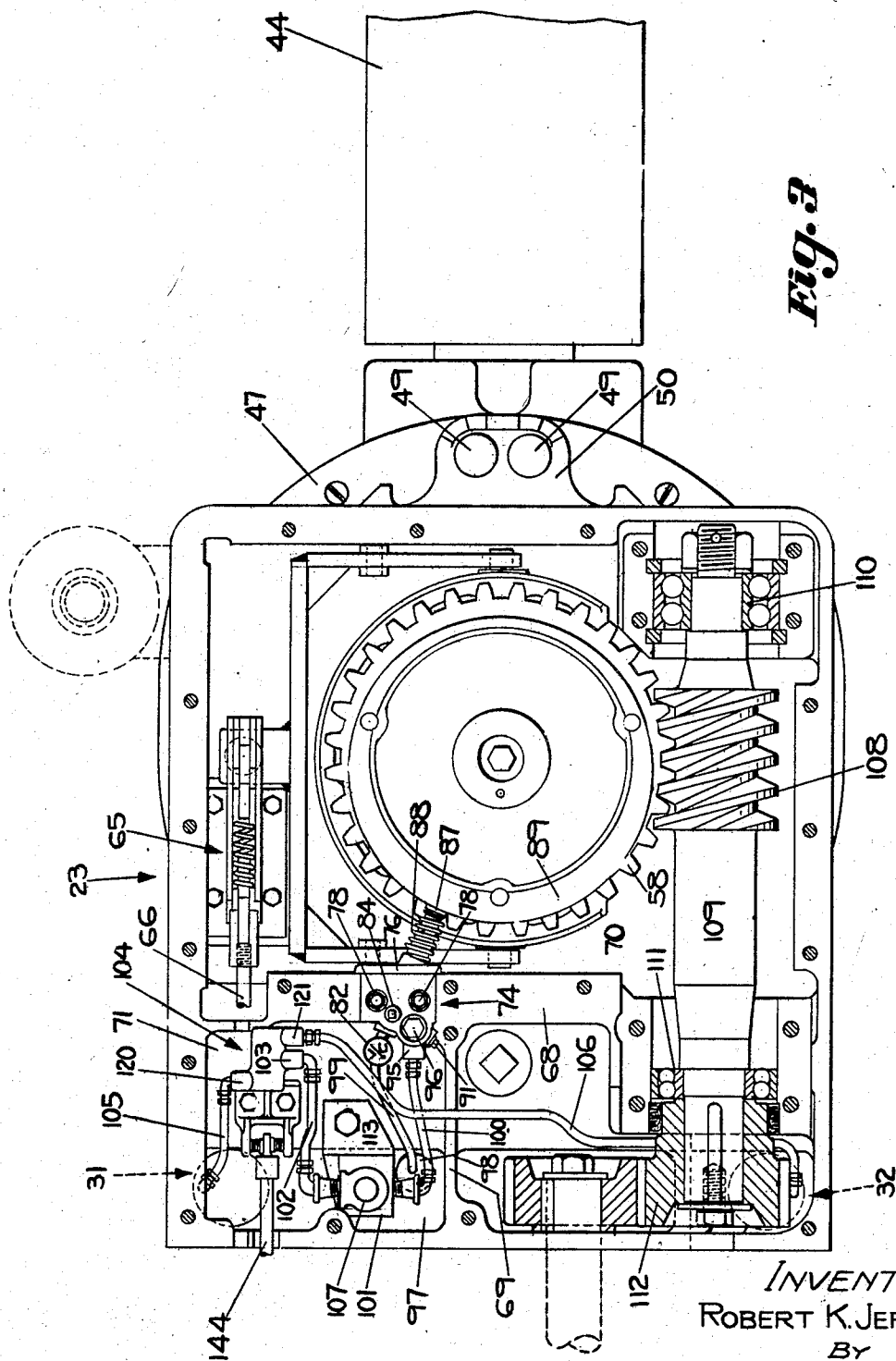


Fig. 3

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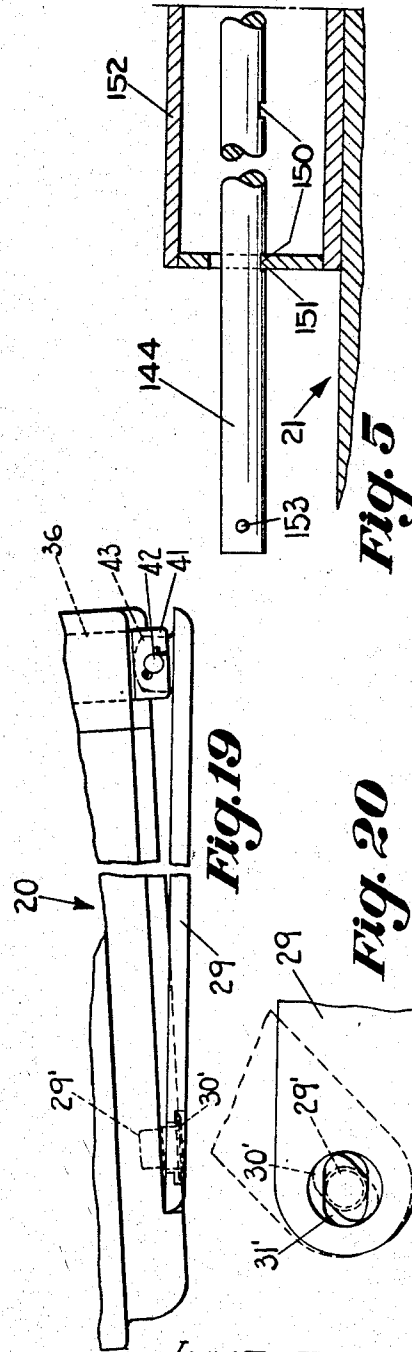
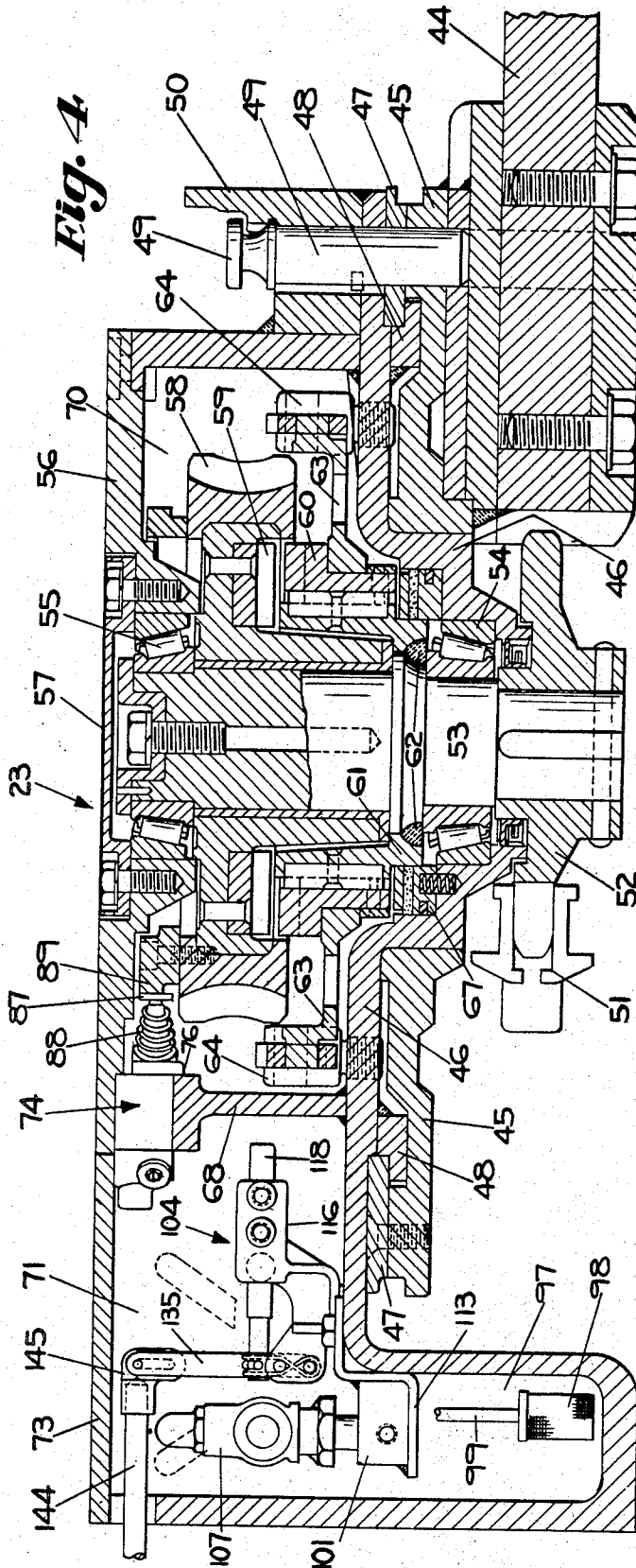
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7 Sheets-Sheet 3



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MINING MACHINE

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7 Sheets-Sheet 4

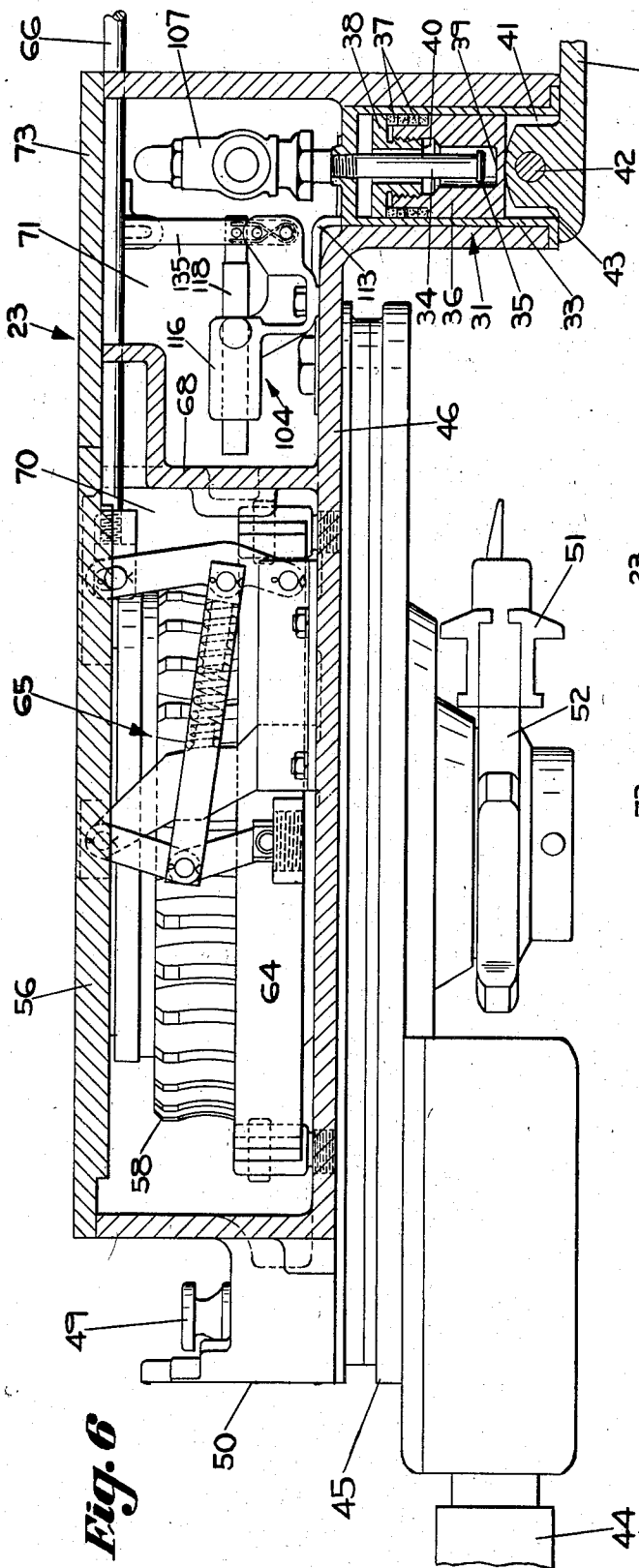


Fig. 6

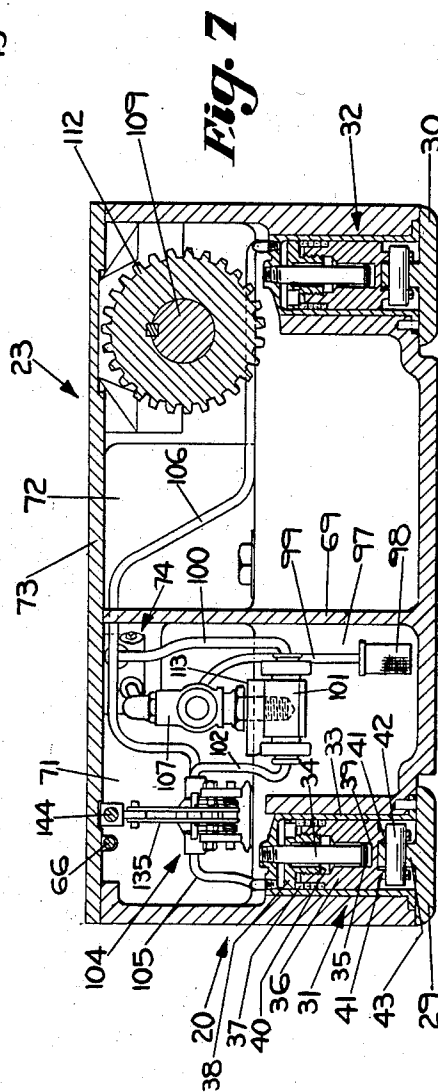


Fig. 7

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MINING MACHINE

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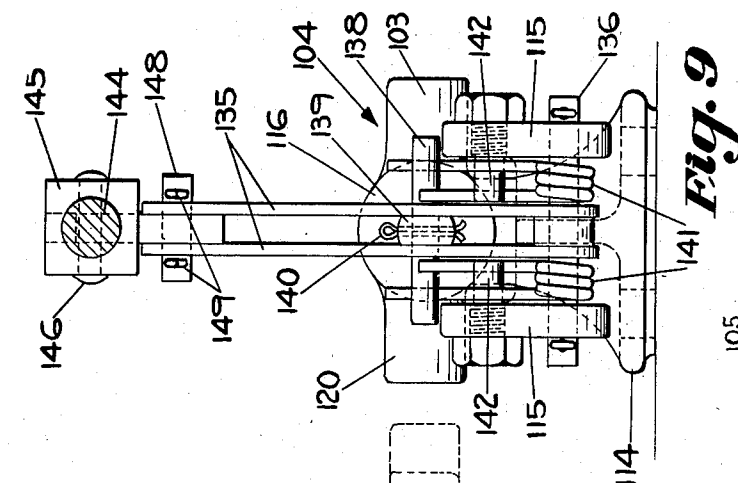


Fig. 9

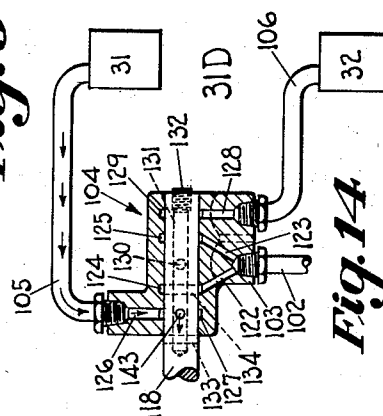


Fig. 14

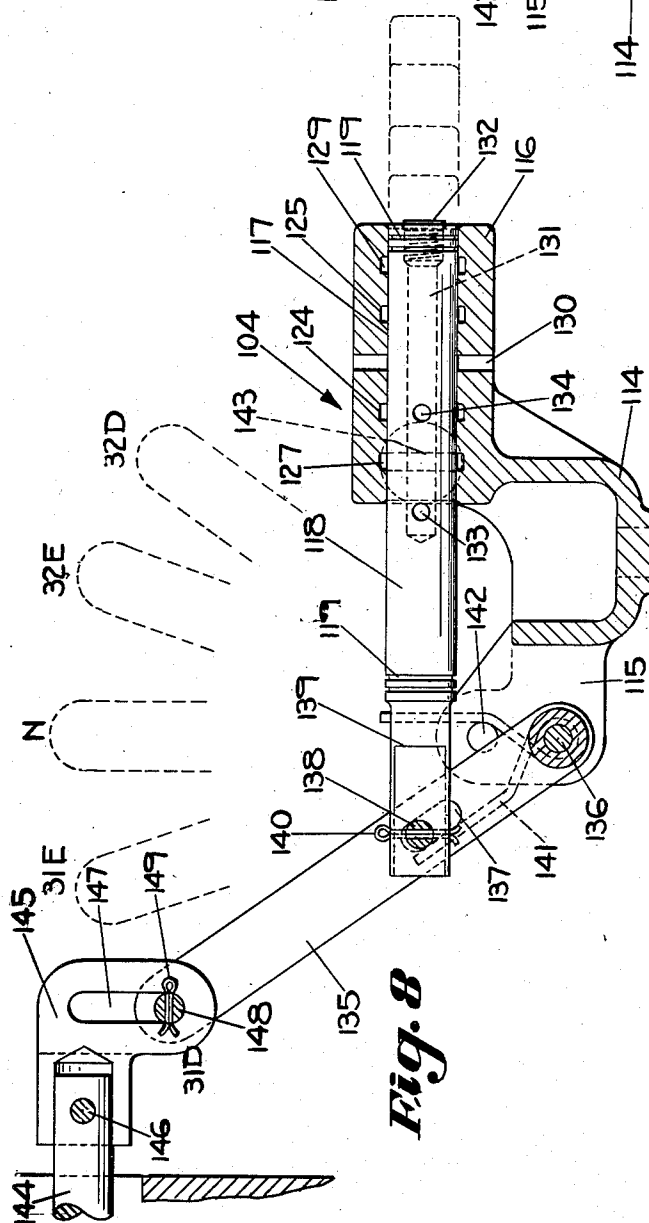


Fig. 8

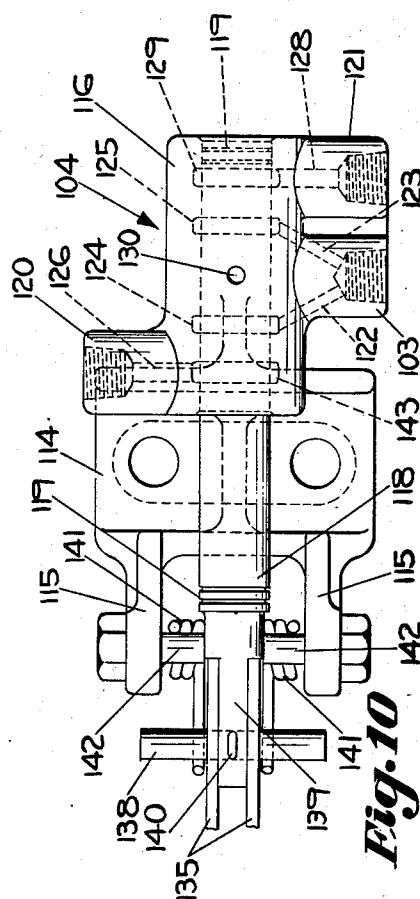


Fig. 10

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MINING MACHINE

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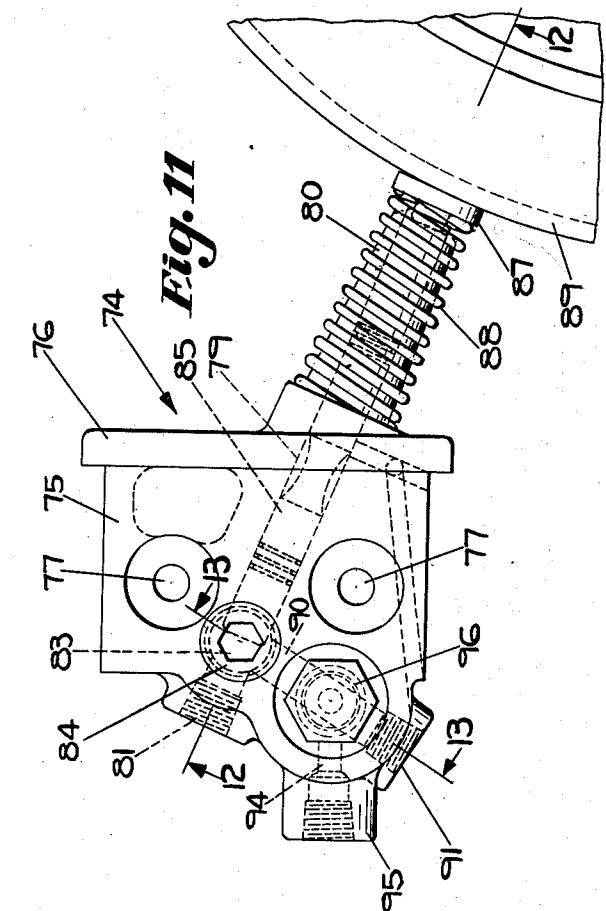


Fig. 11

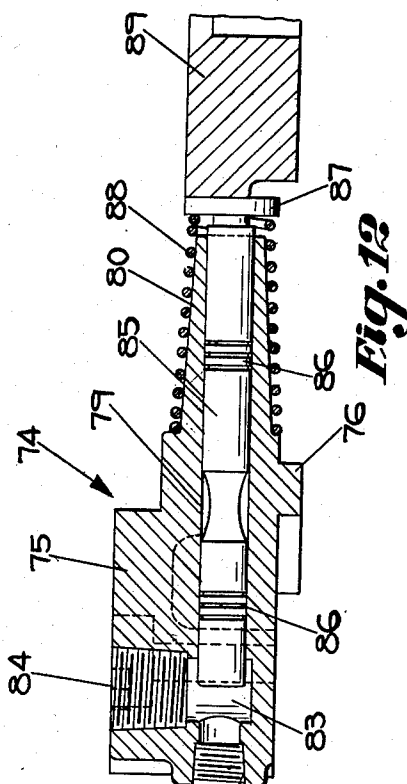


Fig. 12

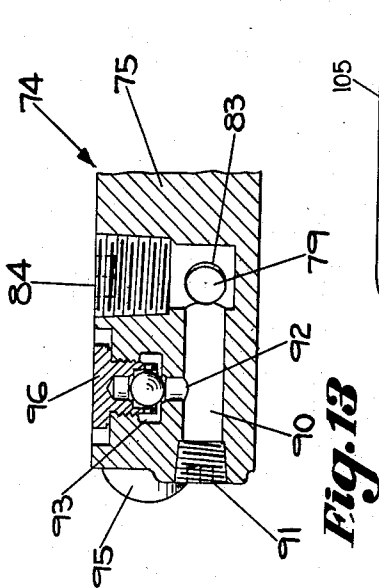


Fig. 13

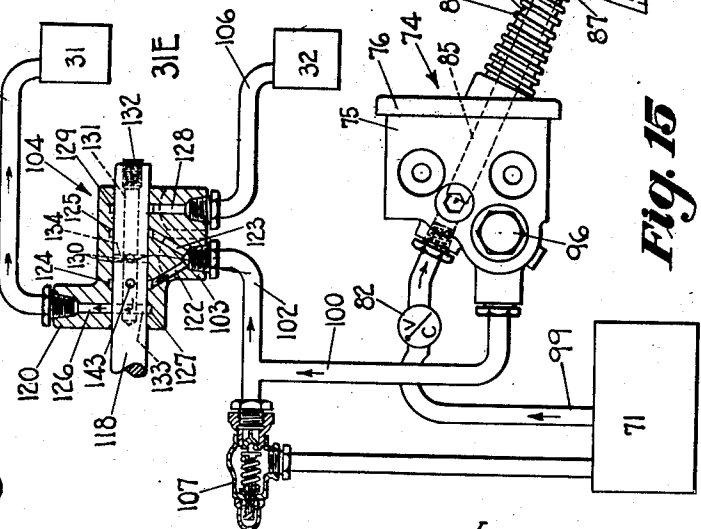


Fig. 15

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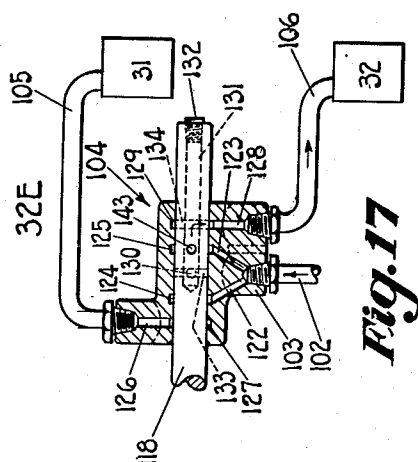


Fig. 17

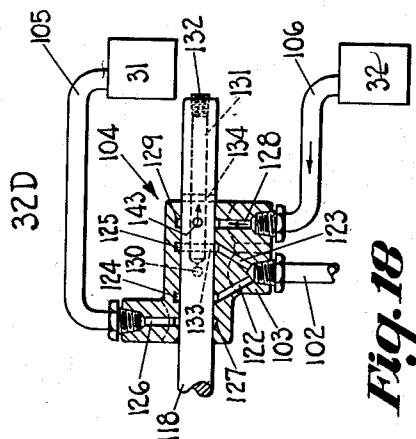


Fig. 18

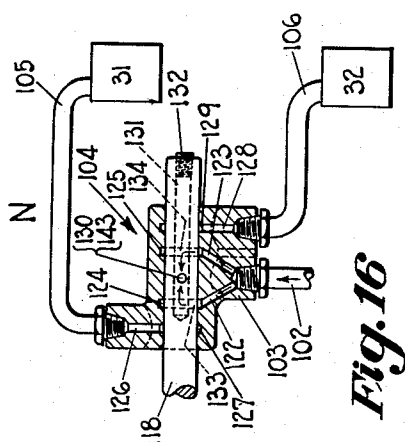


Fig. 16

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UNITED STATES PATENT OFFICE

2,278,656

MINING MACHINE

Robert K. Jeffrey, Columbus, Ohio, assignor to
The Jeffrey Manufacturing Company, a corporation of Ohio

Application June 21, 1938, Serial No. 214,959

5 Claims. (Cl. 60—52)

This invention relates to a mining machine adapted to slide over a mine floor while cutting a kerf and an object of the invention is to provide improved means for adjusting the inclination of said mining machine to determine the path of travel of the cutter bar.

Another object of the invention is to provide an improved hydraulic mechanism for levelling or adjusting the plane of a mining machine to compensate for irregularities in the mine floor or irregularities in the plane of a coal band or a dirt band.

A further object of the invention is to provide an improved control valve for a hydraulic system which is particularly useful in controlling a mining machine.

Still another object of the invention is to provide an improved form of hydraulic pump particularly adapted for use in a mining machine.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a plan view of the mining machine comprising my invention with part of the cutter bar broken away;

Fig. 2 is a side elevational view of the apparatus of Fig. 1;

Fig. 3 is an enlarged plan view of the forward section of the mining machine comprising my invention with the top cover plate removed and with parts shown in section;

Fig. 4 is a sectional elevational view taken on the line 4—4 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a detailed sectional elevational view taken on the line 5—5 of Fig. 1, looking in the direction of the arrows;

Fig. 6 is a sectional elevational view taken on the line 6—6 of Fig. 1, looking in the direction of the arrows;

Fig. 7 is a transverse sectional elevational view taken on the line 7—7 of Fig. 1, looking in the direction of the arrows;

Fig. 8 is a sectional elevational view through the control valve comprising a feature of my invention;

Fig. 9 is an end elevational view of the control valve of Fig. 8;

Fig. 10 is a plan view of the control valve of Fig. 8;

Fig. 11 is an enlarged plan view of the pump comprising a feature of my invention;

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 11, looking in the direction of the arrows;

Fig. 13 is a sectional view taken on the line 13—13 of Fig. 11, looking in the direction of the arrows;

Fig. 14 is a schematic illustration of the hydraulic control system with the control valve in one position of adjustment;

Fig. 15 is a complete schematic showing or piping diagram of the hydraulic control system with the control valve in a different position of adjustment from that illustrated in Fig. 14;

Figs. 16, 17 and 18 are similar to Fig. 14 showing three other positions of adjustment of the control valve;

Fig. 19 is a side elevational view of one of the skids connected to the bottom of the mining machine; and

Fig. 20 is an enlarged view of the means for detachably connecting one end of each of the skids to the bottom of the mining machine.

The invention herein disclosed represents an improvement on the invention disclosed and claimed in Patent No. 2,091,405 of R. K. Jeffrey et al., for a Mining machine, dated August 31, 1937, and Patent No. 2,091,416 of L. E. Mitchell for a Mining machine, dated August 31, 1937.

It will be understood that structural details not herein disclosed in the fullest detail follow the disclosures of the two above mentioned patents.

The mining machine comprising my invention is formed by a main frame 20 made up of the tail section 21, the motor section 22 and the head section 23. Said sections 21, 22 and 23 are bolted together and may be taken apart by the simple expedient of removing nuts 24. The tail section 21 follows the structure disclosed in the above mentioned patents. It therefore needs no particular description except for that hereinafter given in connection with Fig. 5 of the drawings which does represent one novel feature of my invention.

It may be stated in passing, however, that said tail section 21 includes a pair of cable drums 25 and 26 with which are associated cables 27 and 28, respectively, which may be operated to drag the mining machine over a mine floor to effect a mining operation or to move the mining machine from place to place. The motor section 22 likewise follows the structure of each of the above mentioned patents and therefore needs no special description.

Extending along the bottom and side edges of the main frame 20 is a pair of skids 29 and 30, (Figs. 7, 19 and 20), the rear end of which has a diagonally positioned oval head 30' adapted to

receive oval opening 31' in skid 29 or 30 when in the dotted line position illustrated in Fig. 20 and to lock said skid for pivotal movement when in the full line position of said Fig. 20, pivotally attached to the tail section 21 by a pin 29', as illustrated in each of the above mentioned patents. The forward ends of the skids 29 and 30 are pivotally attached to a pair of piston type hydraulic motors 31 and 32, respectively, which follow in structure the disclosures of each of said above mentioned patents. The structures of the two motors 31 and 32 are similar and in the interest of a complete description motor 31 may be briefly described as follows. Said motor 31 comprises a removable cylinder 33 tightly received in a cylindrical opening in the main frame of the head section 23 and provided with a downwardly extending centrally positioned rod 34 having a head 35. Within the cylinder 33 is a piston 36 provided with seal rings 37 which may be clamped to the piston 36 in a receiving groove by a threaded clamping member 38 which has threaded relation with the piston 36. The head 35 of the rod 34 cooperates with a seat 39 in the bottom of the piston 36 and a ledge 40 on the bottom of the clamping member 38 to determine the limits of movement of the piston 36. Adjacent its bottom, piston 36 is provided with a pair of downwardly extending arms 41, 41 (see Fig. 7) adapted to receive a pin 42 to provide a pivotal connection with an upstanding lug 43 on the skid 29. It will thus be evident that vertical adjustment of the piston 36 will provide for pivotal movement of the skid 29 about its rear end to adjust the elevation and inclination of one side of the mining machine.

As previously mentioned, the piston motor 32 is similar in construction to the piston motor 31 and thus it may be operated to adjust the skid 30 about its rear pivotal axis. It is therefore evident that by adjusting the skids 29 and 30, individually, both the transverse and longitudinal slope of the mining machine may be adjusted, the height of the mining machine may be adjusted and as a consequence, the height and/or inclination of the kerf cutting mechanism may also be adjusted. The improved hydraulic system which I have provided for operating the motors 31 and 32 is described in detail hereinafter.

Mounted upon the lower forward portion of the head section 23 is a kerf cutting mechanism comprising a cutter bar 44 rigidly attached to an adjusting plate 45, as by welding, which plate 45 is pivotally mounted upon the bottom plate 46 of the head section 23 for lateral adjustment about the axis of the hereinafter described kerf cutter chain drive shaft.

To maintain the adjusting plate 45 attached to the bottom plate 46 while providing for their adjustment, I provide cooperating ledge plates 47 and 48 which are attached, respectively, to the plates 45 and 46. The adjusting plate 45 is provided with a plurality of spaced apertures as disclosed in full detail in the above mentioned patents, adapted to receive selectively one of a pair of locking pins 49 carried by a projection 50 on the front of the head section 23.

Associated with cutter bar 44 in a well known manner is a kerf cutting chain 51 provided with appropriate cutter bits and adapted to be driven by a drive sprocket 52 keyed to a drive shaft 53 which is journaled in the head section 23 by bottom anti-friction roller bearing 54 and top anti-friction roller bearing 55, the latter of which is carried in a pocket in the removable top plate 56

of the head section 23 and held in place by a removable cover plate 57.

Driving of the shaft 53 is effected from a worm gear 58 through a clutch comprising jaws 59 mounted on said worm gear 58 and shiftable clutching element 60 feathered on a cup 61 which is welded to the shaft 53 as at 62. A shipper 63 operated by a yoke 64 which is controlled by a toggle and link mechanism 65 (see Fig. 6) is provided to effect engagement and disengagement of the clutch to effect a driving or non-driving relation between the worm gear 58 and the drive shaft 53. An operating rod 66 is provided for the toggle and link mechanism 65 which extends to an operator's position adjacent the tail section 21 of the mining machine. The construction of the toggle and link mechanism, as well as the clutch, follows the disclosure of the two above mentioned patents.

To effect a seal, thereby to prevent a loss of oil from the head section 23, I provide a grease seal 67 between the cup 61 and the bottom plate 46, the structure of which is also described in full detail in the above mentioned patents.

It may be mentioned that the head section 23 is divided into three compartments by partitions 68 and 69 (see Figs. 3, 4 and 7), forming compartments 70, 71 and 72, the first of which houses the afore-described drive means for the sprocket 52 and which is adapted to be filled with lubricating oil at all times, and the second of which houses hydraulic control mechanism for the piston motors 31 and 32, hereinafter described in full detail. The third of said compartments is a gear compartment, as hereinafter described in more detail.

It may be mentioned that the compartments 71 and 72 are provided with a common removable top plate 73 by which access is gained to the interior thereof.

Mounted within the partition 68 and forming a part thereof is a hydraulic oil pump 74, the structure of which is disclosed in full detail in Figs. 3, 11, 12 and 13 of the drawings. Said pump 74 comprises a main frame or casting 75 provided with a flange 76 adapted to rest against the partition 68 and provided with a pair of spaced vertical counter-bored holes 77, 77 adapted to receive screws 78 (see Fig. 3), to attach the casting 75 rigidly to the adjacent enlarged portion of the partition 68.

The casting 75 is also provided with a horizontally positioned angularly extending bore 79 which forms the cylinder of the pump 74. For purposes of manufacture, the bore 79 extends completely through the casting 75 and through an extending tapered neck portion 80 thereof and one end is threaded at 81 to receive a nipple of the check valve 82 (see Fig. 3). The bore 79 communicates with a chamber 83 intermediate its ends, which chamber 83 is formed by a vertical bore the top portion of which is closed by a threaded plug 84 to prevent the formation of an air dome.

Within the cylindrical bore 79 I position a piston or plunger 85 provided with spaced oil grooves 86, 86 which extends through the neck portion 80 and is provided with a bearing head 87. Surrounding the neck 80 is a coil spring 88 one end of which bears against the head 87 and the other against a boss of the casting 75 tending to move the piston 85 outwardly or to the right, as viewed in Figs. 11 and 12.

To reciprocate the piston 85, and particularly to move it against the action of the spring 88,

I provide an eccentric cam 89 which is rigidly attached to the worm gear 58 by appropriate screws, as clearly illustrated in Figs. 3 and 4 of the drawings. It is thus to be seen that the worm gear 58 which is in the gear train for driving a kerf-cutting mechanism, including the cutter chain 51, is also employed to drive the hydraulic pump 74.

As clearly illustrated in Fig. 3 of the drawings, there is associated with the threaded portion 81 a check valve 82 which permits oil to flow into the chamber 83 under the suction influence of the retreating piston 85 but prevents oil from flowing outwardly therefrom through the threaded port 81 under the influence of the inward movement of said piston 85. In other words, the check valve 82 controls the inlet of fluid to the chamber 83.

The out-put of the fluid from the chamber 83 is afforded by way of a horizontal passage 90 which communicates with chamber 83 and which is closed by a plug 91. Passage 90 communicates with a vertically disposed port 92 leading to a chamber 93 which, in turn, communicates with outlet passage 94 leading to an internally threaded boss 95 adapted to receive the pressure line of the hydraulic control system, as hereinafter described in full detail.

A removable ball check valve 96 is associated with the port 92 and provides for free flow of oil to the passage 94 from the passage 90 but prevents a reverse flow thereof. In other words, the check valve 96 controls the proper outward flow of fluid from the pump 74 to the out-put or pressure line. It will thus be seen that upon operation of the cam 89, which operates whenever the driving motor is in operation without regard to whether the kerf-cutter is in operating or non-operating condition, the hydraulic pump 74 will be operated to supply pressure to the hydraulic control system for the piston motors 31 and 32, as hereinafter described in full detail.

Before describing in detail the control valve which controls the operation of the hydraulic piston motors 31 and 32, attention is directed particularly to Figs. 3, 4, 7 and 10 and to the general system for controlling said piston motors 31 and 32. It is to be noted that within the compartment 71 there is formed an oil sump 97 (see Fig. 4) in the bottom of which is positioned an oil strainer 98 connected by a feed pipe 99 to the previously described check valve 82. This provides for the feeding of oil or other hydraulic medium to the pump 74, it being understood that the sump 97 is maintained full of oil or at least at a level above the strainer 98 at all times.

Leading from the boss 95 of the pump 74 is the pressure line or pipe 100 which is connected to said boss 95 by an appropriate threaded nipple. The pressure line 100 is connected to a block 101 by an appropriate nipple which block 101 is provided with a horizontal through passage leading to an outlet pressure pipe 102 which, in turn, leads to the pressure boss 103 of the control valve 104 illustrated in detail in Figs. 8, 9 and 10. From the control valve 104 a feed pipe 105 leads to the hydraulic piston motor 31 and a feed pipe 106 leads to hydraulic piston motor 32.

It may be stated generally that by operation of the control valve 104 oil under pressure supplied thereto by the pump 74 may be diverted either to the sump 97 or to selected ones of the piston motors 31 or 32, as hereinafter described in full detail.

Also associated with the block 101 and in communication with the previously described longitudinal passage thereof which connects the pressure pipes 100 and 102 is an upwardly extending passage leading to a pressure relief valve 107 adapted to discharge oil to the sump 97 whenever excessive pressure is realized in the pressure line 100.

As hereinafter described in full detail, the pressure relief valve 107 is to take care of an emergency condition because in normal operation a low pressure by-pass is provided for the pump 74 thereby providing for its operation at substantially no-load except when it is doing useful work.

Before proceeding with the description of the control valve 104, attention is directed to the drive for the worm gear 58 which is illustrated particularly in Figs. 3 and 7 of the drawings. As clearly illustrated in Fig. 3, a worm 108 carried by a shaft 109 meshes with the worm gear 58. Shaft 109 is mounted in anti-friction bearings 110 and 111, the latter being carried by partition 68. At its rear end the shaft 109 has keyed thereto a pinion 112 which is housed in compartment 72 and meshes with the drive pinion, not illustrated, on the end of the armature shaft of the electric motor carried within motor section 22, which shaft extends into compartment 72. It is thus to be seen that whenever the electric motor of the mining machine is in operation there will be a driving connection to the cam 89 which will cause the pump 74 to provide fluid pressure for operating the hydraulic piston motors 31 and 32. This is independent of the operation of the kerf-cutting mechanism though, of course, the hydraulic system may be operated at the same time that the kerf-cutting mechanism is in operation.

Before proceeding with the description of the detailed structure of the control valve 104, it is to be noted that the block 101 is carried by a bracket 113 (see Figs. 3 and 4), bolted to the bottom plate 46 of the section 23 above the sump 97 and within the compartment 71. The control valve 104 is also within the compartment 71 and bolted to the bottom plate 46 of section 23, as clearly illustrated in Fig. 3 of the drawings. It is thus to be seen that the control valve 104, pressure relief valve 107 and the block 101, the pump 74, as well as all of the connecting pipes or lines, except part of the feed pipe 106, are within the compartment 71 where they are fully enclosed and protected.

As clearly seen in Figs. 8, 9 and 10 of the drawings, the control valve 104 comprises a main body or casting comprising a base 114, a pair of rearwardly extending arms 115, 115 and a cylindrical member 116. The cylindrical member 116 is provided with a horizontal longitudinally extending cylindrical bore 117 adapted to receive a sliding piston or plunger 118 provided with spaced end oil sealed grooves 119, 119. The cylindrical member 116 carries a previously mentioned pressure boss 103 which is connected to pressure pipe 102 and carries bosses 120 and 121 connected, respectively, to previously mentioned feed pipes 105 and 106. Boss 103 is provided with a pair of pressure passages 122 and 123 leading to pressure chambers 124 and 125, respectively, formed in cylindrical member 116. Boss 120 is provided with a feed passageway 126 leading to feed chamber 127 and boss 121 is provided with feed passage 128 leading to feed chamber 129. Interme-

diates its ends the cylindrical member 116 is also provided with a vertical bore 130.

It may be stated that the feed chamber 127, pressure chamber 124, bore 130, pressure chamber 125 and feed chamber 129 are spaced progressively from the rear end to the front end of the cylindrical member 116 and each is spaced the same distance from the next successive one so that upon giving five equal movements to the piston 118 a selected point will progressively move from chamber 127 to chamber 129 in the sequence above set forth for the purpose hereinafter described in full detail.

The piston 118 is provided with a longitudinally extending bore 131 which is closed by a plug 132 and communicates with a pair of horizontally extending ports 133 and 134, midway between which is a vertically extending port 143, which ports 133, 143 and 134 are spaced apart equal distances which distances are equal to those between chambers 127 and 124, chamber 124 and bore 130, bore 130 and chamber 125, and chambers 125 and 129.

To provide for the shifting of the piston 118 longitudinally to control the operation of the hydraulic piston motors 31 and 32, I provide an operating lever 135 which is pivoted to a pin 136 carried by the arms 115 and provided with an elongated slot 137 adapted to receive a pin 138 which extends through a neck portion 139 of the piston 118. A cotter key 140 extends through the pin 138 and neck 139 to hold them together.

To provide for automatic centering of the piston 118 I provide a pair of similar spring means 141 which are coiled about the pin 136 and have upstanding arms adapted to engage alternately the pin 138 and stops 142 carried by the arms 115. It will be evident that the spring means 141 urge the piston 118 to a neutral position in which the ports 133 and 134 are opposite the chambers 124 and 125, respectively, and that when said piston 118 is moved in either direction from this normal position, it will be automatically returned when the moving force is removed.

As clearly illustrated in Fig. 8 of the drawings, there are five operating positions for the lever 135 designated N which is the neutral position (see Fig. 16), 31E which is the position at which hydraulic piston motor 31 is elevated (see Fig. 15), 32E which is the position at which hydraulic piston motor 32 is elevated (see Fig. 17), 31D which is the position at which hydraulic piston motor 31 is discharged (see Fig. 14), and 32D which is the position at which hydraulic piston motor 32 is discharged (see Fig. 18). When the lever 135 is in the neutral or N position, with piston 118 in the position illustrated in Fig. 16, the port 143 will be aligned with the bore 130 and oil under pressure from the line 102 will flow through the boss 103, passages 122 and 123 in parallel, chambers 124 and 125, ports 133 and 134 to bore 131 from which it will be discharged by port 143 through said bore 130 into the sump 97 of the compartment 71. It will thus be seen that in this condition the pump 74 will have a substantially no-load by-pass whereby the out-put of oil therefrom will flow freely to the sump 97 and thus the pump will not be required to do work which serves no useful purpose.

When the lever 135 is moved forward to position 32E with piston 118 in the position illustrated in Fig. 17, communication is provided from pressure pipe 102 through boss 103, passage 123, chamber 125, through port 143 which is now

in alignment with chamber 125, through bore 131, port 134, to chamber 129 from which it flows through passage 128 in boss 121 to feed pipe 106 connected to hydraulic piston motor 32. It is evident that when this oil under pressure is supplied above the piston of said piston motor 32, said piston will be moved downwardly thereby to elevate that side of the mining machine by virtue of the downward movement of the skid 30 with respect thereto. In said position 32E it may be noted that the port 133 is in the plane of the bore 130 but since they extend at right angles to each other no communication is provided between them and port 133 is effectively sealed.

By moving the lever 135 to the position 32D with piston 118 in the position illustrated in Fig. 18 the oil in the hydraulic piston motor 32 is allowed to discharge under the pressure caused by the weight of the mining machine thereon, the discharge passageway being from feed pipe 106 to chamber 129 by way of passage 128, through port 143 which is in alignment with chamber 129, through bore 131 and out of port 134 into the sump 97, since port 134 in this position extends beyond the forward extremity of the cylindrical member 116 and is exposed to atmosphere in the compartment 71.

When the lever 135 is moved to the position 31E with piston 118 in the position illustrated in Fig. 15 pressure from the pressure pipe 102 flows through boss 103, passage 122, chamber 124, port 143, bore 131, port 133, chamber 127 to feed passage 126 in boss 120, thence by feed pipe 105 to the hydraulic piston motor 31. This oil under pressure supplied to piston motor 31 will force the piston 36 thereof downwardly relative to the mining machine thus causing elevation of that side of the mining machine through the skid 29.

To discharge the hydraulic fluid from the hydraulic piston motor 31 the lever 135 is moved to position 31D with piston 118 in the position illustrated in Fig. 14 in which position the fluid can flow therefrom through the feed pipe 105 to chamber 127 which now communicates with port 143 leading to bore 131 and through port 133 to the chamber 71, thus providing for free discharge of the hydraulic fluid into the sump 97.

It may also be mentioned that when the lever 135 is in the position 31D or 32D to discharge the fluid from the hydraulic piston motors 31 or 32, respectively, there will be a by-pass for the pump 74 to prevent its operating under load while no useful work is being performed. This is evident from a consideration of Figs. 8 and 14 of the drawings in which the control valve 104 is illustrated in position 31D and which oil under pressure from the pipe 102 is free to flow to the passage 122, chamber 124, port 134, bore 131 and into the compartment 71 by way of port 133. When the lever 135 is in the position 32D illustrated in Fig. 18, the by-pass for the pump 74 is provided from the pressure pipe 102 through passage 123, chamber 125, port 133 in alignment therewith, bore 131 and out port 134 into chamber 71.

It is thus to be seen that the continuously operating pump 74 is provided with a no-load by-pass not only for the normal or non-operating position of the control valve 104, but also for the positions thereof in which the hydraulic piston motors 31 and 32 are being discharged.

It is also to be noted that when the lever 135 is in the neutral position a no-load by-pass is not only provided for the pump 74, but both of

the hydraulic piston motors 31 and 32 are locked in their selected positions. This is due to the fact that when said lever 135 is in the neutral position there is no port 133, 134 or 143 in communication with the chambers 127 or 129. In other words, under these conditions the chambers 127 and 129 are sealed, thereby sealing the oil in the hydraulic piston motors 31 and 32.

It is of importance to note that in the operation of the control valve 104 from the neutral position in either direction, the first position encountered is one to expand the hydraulic piston motor 31 or 32 and the second position is one to discharge the hydraulic piston motor 31 or 32. As a consequence, either hydraulic motor 31 or 32 may be operated to a desired position of elevation of the mining machine whereupon the lever 135 will be released and automatically returned to its neutral position to lock the operated motor in its position of adjustment without passing through a release or discharge position for said hydraulic piston motor.

To provide for the control of the lever 135 from a position adjacent the tail section 21 where the other controls for the mining machine are assembled, I provide a longitudinally extending rod 144 having a head 145 which is attached to said rod 144 by a pin 146. The head 145 is provided with an elongated slot 147 adapted to receive a pin 148 carried by the upper end of the lever 135 and providing a pivotal sliding connection between the rod 144 and the lever 135. Cotter keys 149 are provided to maintain the pin 148 in place.

The rod 144 extends from the head section 23 through the motor section 22 and to a position at the forward end of the tail section 21, as clearly illustrated in Fig. 1 of the drawings.

As best seen by reference to Figs. 1 and 5 of the drawings, the rod 144 is provided with a pair of spaced notches 150 adapted to latch over an edge 151 of a housing 152 adjacent the forward end of said tail section 21. The notches 150 are so positioned as to correspond with positions 31E and 32E of the lever 135. As a consequence, said notches 150 serve the double purpose of indicating to an operator who is operating the rod 144 that the lever 135 is in the position 31E or 32E, and of latching said lever 135 in either position 31E or 32E so that continued expansion of a hydraulic piston motor 31 or 32 may be continued without requiring the operator to hold the rod 144 manually in motor expanding position. In other words, for the operator to expand a hydraulic piston motor 31 or 32 it is only necessary to move the rod 144 forwardly or rearwardly from its neutral position and to latch a notch 150 over the edge 151. When this interlocking relation is released the lever 135 will automatically return to its neutral position, as previously described.

To aid in the operation of the rod 144 said rod is provided with a cross-pin 153 which provides a handle to be grasped by the operator.

In the operation of the device comprising my invention, it will be evident that the electric motor carried by the motor section 22 will drive the eccentric cam 89 whenever the motor is in operation, as a consequence of which the pump 74 is a continuously operating pump and provides fluid pressure at all times during the operation of said motor. The drive for the kerf-cutting mechanism is selectively controllable and is driven from the same electric motor through

the gear train including the vertical drive shaft 53 and the sprocket 52.

The available hydraulic liquid under pressure from the pump 74 can be supplied at will by the operator by operating the rod 144 to expand selectively the hydraulic piston motors 31 and 32. It is furthermore to be noted that said hydraulic piston motors 31 and 32 are automatically locked in any expanding position upon release of the rod 144. It is thus possible to adjust the level of the mining machine and consequently the level of the cutter bar 44 in both longitudinal and transverse planes, thus to accommodate the mining machine to an uneven mine floor or to an uneven seam of coal or other material which is to be cut out.

It is further evident that the operator may discharge the fluid from the hydraulic piston motors 31 and 32 selectively by operation of the same rod 144. It is thus manifest that a very flexible control for the levelling of the mining machine and cutter bar is provided and one which requires no appreciable effort or skill on the part of the operator.

It is furthermore to be noted that the hydraulic system is operative at all times to provide pressure when useful work is to be done, yet when no useful work is being done the pump of said system operates at substantially no-load.

It is still further to be noted that the hydraulic system is substantially entirely confined to a totally enclosing housing with the mining machine thereby fully protected. In this connection it may particularly be noted that there are no pipes or conduits whatever of the hydraulic control system which are directly exposed or subject to damage, all of said pipes being completely enclosed within the housing of the head section 23.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. Apparatus of the class described comprising the combination with a pair of fluid-pressure motors for effecting adjustments in the apparatus, of a power-driven pump, controlling means connecting the pump to said motors and comprising a control valve having five positions including a neutral position, a motor actuating position for each motor and a motor discharging position for each motor, means for actuating said control valve from its neutral position to either of the motor actuating positions before reaching the motor discharge positions, and automatic means operable upon release of said actuating means to effect movement of the valve to neutral position while both motors are locked in adjusted positions and the pump is provided with a no-load by-pass.

2. In apparatus of the class described, the combination with a pair of hydraulic motors, of a hydraulic system for controlling said motors and including a power driven operating pump and a control valve connected to said pump and to said motors, said control valve having five positions comprising a neutral position, a motor actuating position for each motor and a motor discharging position for each motor, said posi-

tions being so located that when said valve is moved on either side of the neutral position to control the individual motors the motor actuating position is first reached, said valve being so constructed and arranged that when in its neutral position both motors are locked.

3. In valve mechanism for apparatus of the class described, a valve block having a slide guideway therein with a conduit leading therefrom through the block to the atmosphere intermediate the ends of the block, said guideway having spaced-apart recesses therein between said conduit and one end of said block to provide flow chambers, a supply conduit connecting the pump to one of said chambers, a motor conduit connected to the other chamber, a valve element slidable along said guideway and provided with an internal longitudinal bore closed at its ends and having radial passageways leading therefrom, said radial passageways being successively out of phase relation but spaced to correspond with the spacing between the first-named conduit and said chambers, and mechanism for sliding said valve to three predetermined positions of control, one position being to connect the said supply conduit to one of said chambers and thence through one of said radial passageways and through the bore to another of said radial passageways to the other chamber and to the motor conduit, another position being to connect said supply conduit to one of said chambers and thence through one of said radial passageways to said bore and to another radial passageway to the valve block conduit leading to the atmosphere, and the third position being to connect the motor conduit to one of said chambers and one of said radial passageways and thence through said bore to another radial passageway then exposed to the atmosphere.

4. In valve mechanism for apparatus of the

class described, the combination with a valve block having a bore, of a valve stem slidable along and through said bore, said block having a port extending from said bore to the atmosphere intermediate the ends of said block and circular recesses near the ends of said block and near the center of said block and said valve stem having a longitudinal recess therein with three spaced ports extending radially from such recess, the intermediate one only being capable of registering with the said port to the atmosphere, delivery ports connected to those circular recesses near the ends of the block, and a supply port connected by branching conduits to those circular recesses near the center of the block, the construction and arrangement being such that when the valve stem is in neutral position the supply port is connected to the port opening to the atmosphere and when the valve stem is in an operating position the port to the atmosphere is cut off and the supply port is connected to one of the delivery ports.

5. Apparatus of the class described comprising the combination with a pair of adjustable hydraulic motors, a power driven operating pump, control valve mechanism, conduits and connections affording said control valve mechanism with five positions including an intermediate neutral position and two motor actuating positions and two motor discharging positions, one motor having an actuating valve position and a discharging valve position on one side of the valve neutral position and the other motor having an actuating valve position and a discharging valve position on the other side of the valve neutral position, the construction and arrangement being such that when the valve mechanism is in neutral position both of said hydraulic motors are locked in adjusted positions.

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