

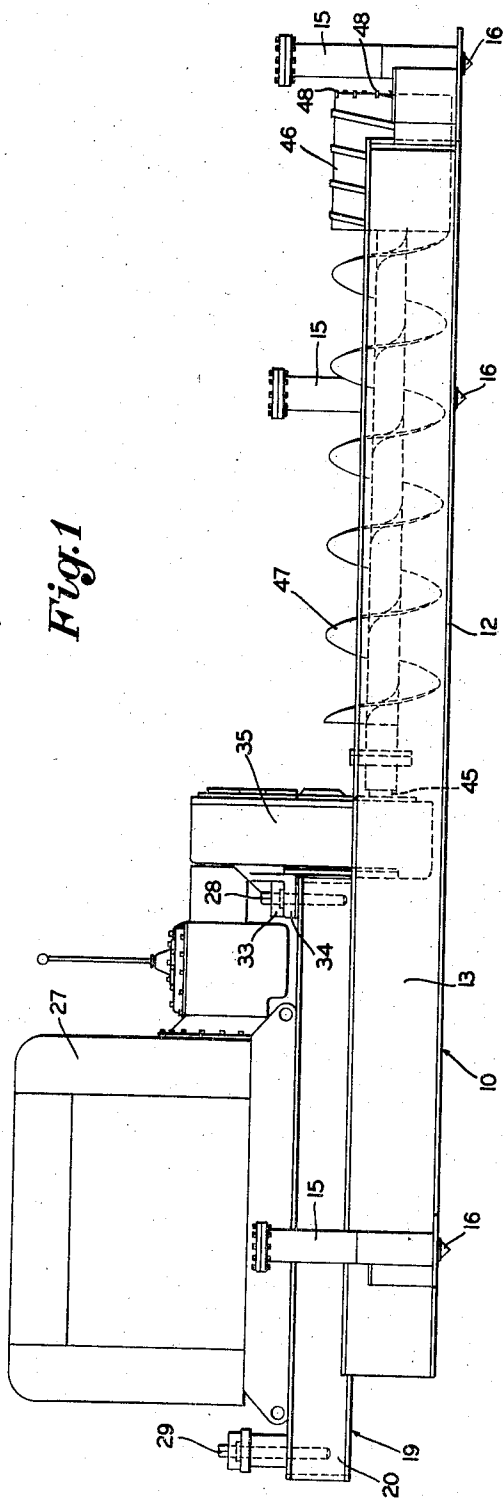
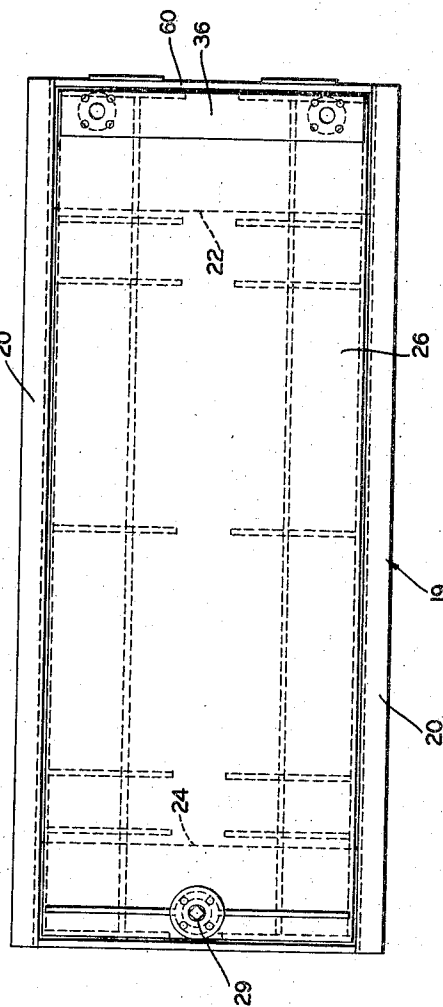
April 7, 1959

V. J. McCARTHY
COAL MINING MACHINE

2,880,707

Filed May 11, 1954

3 Sheets-Sheet 1



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Fig. 3

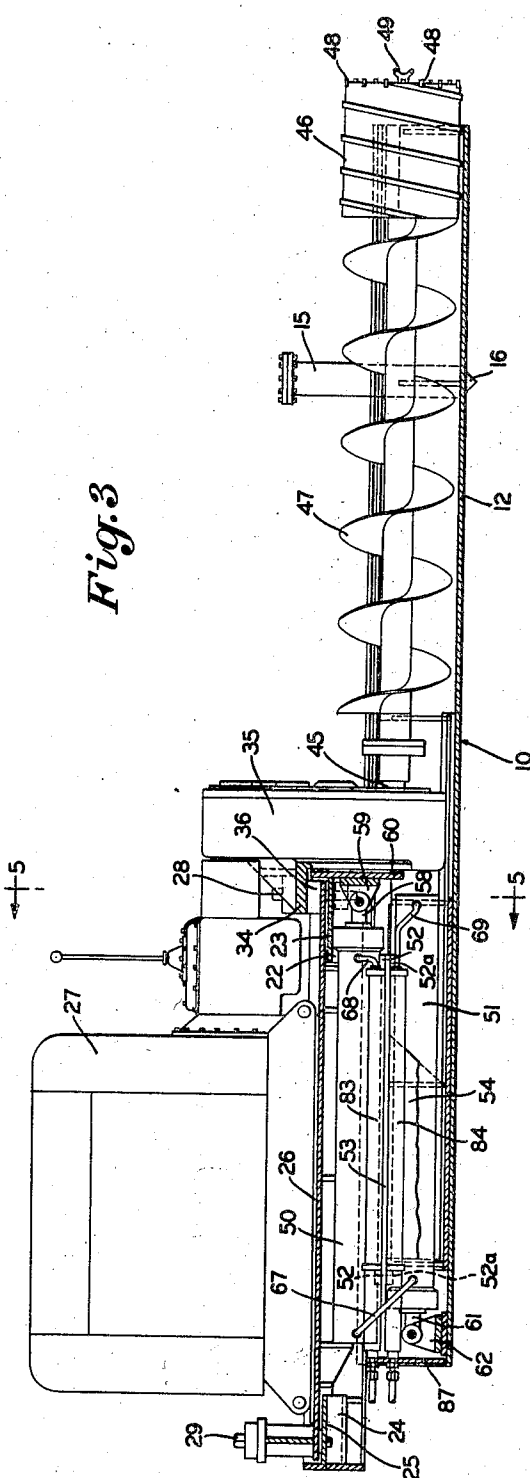
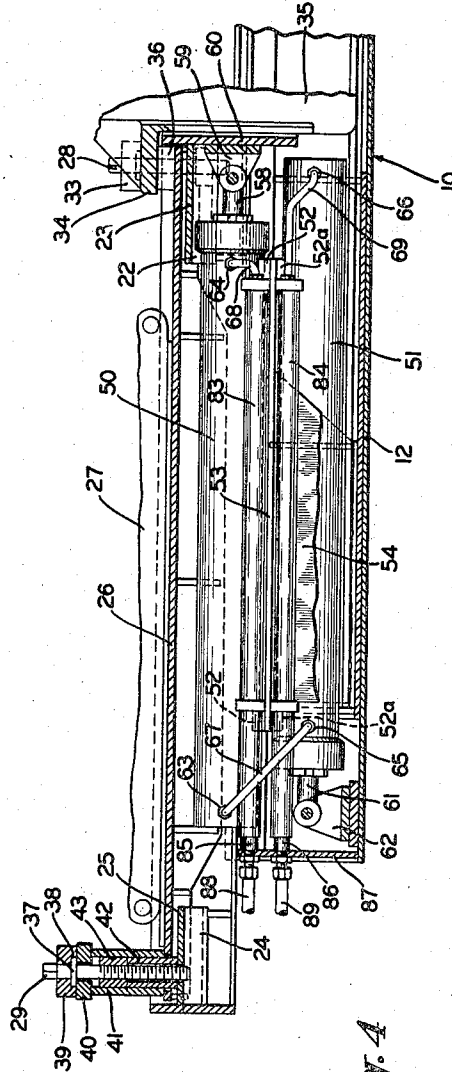


Fig. 4

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1

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COAL MINING MACHINE

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4 Claims. (Cl. 121—45)

The invention relates to apparatus for mining coal or other minerals, and more particularly to a machine in which a mining head and helical conveyor, of the general type disclosed in Joseph F. Joy Patent No. 1,445,085, is advanced into a coal vein to mine and remove coal therefrom.

Machines of this general character such as are now in general use comprise an elongated frame having guideways thereon, upon which is mounted a power driven carriage having a motor thereon for rotating the mining head.

These mining heads and the helical conveyor sections which are used therewith, are made in various diameters for recovering coal from veins or seams of various thickness. In the past it has been customary to provide a mining machine of the type referred to adapted for use with a mining head of a given diameter.

This necessarily limited the use of the mining machine to the mining of coal seams of a thickness substantially the diameter of the mining head. Such a machine is obviously not practical for mining a coal seam of less thickness because a considerable amount of the surrounding rock would be mined with the coal. And likewise, if the coal seam were of substantially greater width, it would not be practical to mine it with the same size mining head, as a considerable waste in unmined coal would result.

An important object of the present invention therefore, is to provide a mining machine of the general type referred to which is adapted for using mining heads and helical conveyors of various diameters, whereby the same machine may be used to mine coal seams of various thickness.

Another object is to provide such a mining machine having means for raising and lowering the motor relative to the carriage so as to accommodate mining heads of various diameters.

A further object is to provide a mining machine of this character in which the motor base is vertically adjustable upon the carriage by means of jack screws.

A still further object is to provide a mining machine of the type referred to in which the carriage is adapted to be moved longitudinally upon the guideways of the frame by means of hydraulic cylinders.

Another object is to provide for such movement of the carriage by means of a pair of cooperating cylinders, so arranged that fluid is admitted to one cylinder for operating the same, and subsequently discharged therefrom into the second cylinder for operating it.

A further object is to provide floating double cylinders for conveying fluid to and from the operating cylinders.

The above and other objects, apparent from the drawings and following description, may be attained, the above described difficulties overcome and the advantages and results obtained, by the apparatus, construction, arrangement and combinations, sub-combinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which

2

applicant has contemplated applying the principle, being set forth in detail in the following description and illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of a mining machine embodying the invention;

Fig. 2 a top plan view of the carriage and motor base, showing the jack screws for raising and lowering the motor base relative to the carriage;

Fig. 3 a longitudinal, sectional view through the mining machine;

Fig. 4 an enlarged, sectional view of the carriage and adjacent portion of the frame, showing the hydraulic cylinders for operating the carriage;

Fig. 5 is a transverse, sectional view through the machine, taken as on the line 5—5, Fig. 3;

Fig. 6 an enlarged, longitudinal section through one of the hydraulic cylinders, showing the valve in the piston thereof; and

Fig. 7 a further enlarged, fragmentary, transverse section, taken on the line 7—7, Fig. 6.

Referring now more particularly to the embodiment of the invention illustrated in the drawings, in which similar numerals refer to similar parts throughout, a mining machine of the general character referred to is illustrated. Such mining machines are made in different sizes, not only for operating with mining heads and auger conveyor sections of different diameters, but also for use with auger sections of different lengths.

It is customary to make these auger sections in lengths of either 6 feet, 12 feet or 24 feet. The machine illustrated in the drawings is made for use with 6 foot auger sections, but it should be understood that the machine may be of increased length accordingly to handle longer auger sections without in any way departing from the invention.

In general terms the invention may be stated as comprising an elongated frame provided with vertically disposed hydraulic jacks for supporting the frame at desired height and properly positioned above the ground so as to properly position the mining assembly or boring head and conveyor sections relative to the coal seam to be mined.

This mining assembly comprises generally a boring or mining head and a plurality of helical or auger conveyor sections, connected end to end, positioned longitudinally in the frame of the machine and operatively connected to the motor which is mounted upon the carriage of the machine, movable longitudinally upon the frame for rotating and advancing or retarding the mining assembly.

The carriage is adapted to be moved longitudinally upon the frame by means of a pair of hydraulic cylinders coupled together and having valve means therein for admitting fluid from one cylinder to the other, the piston of one cylinder being connected to the rear portion of the frame and the piston of the other cylinder being connected to the forward portion of the carriage.

For the purpose of raising or lowering the motor, so as to accommodate mining heads and auger conveying sections of different diameters, the motor is mounted upon a base which is vertically adjustable upon the carriage by means of vertical jack screws.

The structure thus set forth in general terms will now be described in detail, with particular reference to the accompanying drawings, in which an embodiment of the invention is illustrated as including a frame indicated generally at 10.

This frame is shown as made up of a spaced pair of angle members 11 mounted upon a bed plate 12 and braced thereon by means of the outer diagonal members 13 which may be welded or otherwise connected at their

upper portions to the upper edges of the channel members 11 and at their lower edges to the plate 12.

Diagonal members 14 are also provided upon the inner sides of the channel members 11, welded or otherwise connected to the channel members and to the plate 12 so as to reinforce and brace these channel members which form the support for the carriage as will be later described.

The frame 10 is provided near each corner with a hydraulic jack for supporting the frame at the desired height above the ground and for truing and leveling the machine preparatory to boring into a coal seam.

These jacks are generally indicated at 15, being preferably in the form of hydraulic cylinders as shown and having the downwardly directed plungers with conical or pointed lower ends, as indicated at 16, for contact with the ground.

Suitable oil lines, provided with valves (not shown), are provided for operating the hydraulic jacks in conventional manner. These jacks in themselves form no part of the present invention and are not illustrated or described in detail.

Angle members 17 are bolted, or otherwise attached, to the upper portions of the channel members 11, on the inner sides thereof, and properly spaced below the upper flanges 18 of the channel members forming therewith longitudinal guideways in which the carriage is slidably mounted for longitudinal movement as will be hereinafter described.

The carriage is indicated generally at 19 and includes a pair of side frames in the form of channel members 20, the lower flanges 21 of which are slidably received in the guideways comprising the angle members 17 and the upper flanges 18 of the channel frame members 11.

The carriage includes the plate 22 at the forward end of the carriage, the ends of which are welded or otherwise connected to the opposed surfaces of the channel members 20. The central portion of the plate 22 is arched as at 23 for a purpose to be later described.

A similar plate 24 is connected to the rear end portions of the channel members 20 of the carriage and centrally arched as at 25. The motor base comprises a plate 26 of slightly less length and width than the carriage.

For the purpose of raising and lowering the motor base, so as to accommodate mining heads and auger conveyor sections of different diameters, the motor base 26, which supports the motor 27, is vertically adjustable upon the carriage as by the pair of jack screws 28 at the forward end and the jack screws 29 at the rear end of the carriage.

Each of these jack screws 28 has a collar 31 near its upper end received in a slot 32 in a block 33 bolted or otherwise attached to the flange 34 upon the rear side of the gear case 35. Each jack screw 28 is also rotatably located through the plate 36, and the lower end of each jack screw 28 is threaded into a nut 22a fixed upon the plate 22 of the carriage.

The rear jack screw 29 is provided, near its upper end, with a collar 37 received in a socket 38 in the block 39 fixed upon the block 40, to which is attached the sleeve 41 attached at its lower end to the motor base 26, and slidable over the flange 42 and nut 43 attached to the arched portion 25 of the rear plate 24 of the carriage.

It will be seen that by rotating the jack screws 28 and 29 the motor base 26 may be raised or lowered relative to the carriage. The gear case 35 is thus raised and lowered with the motor base 26.

The crankshaft 44 of the motor is operatively connected, through the gear case 35, with a coupling member 45 adapted to be coupled to the rear end of the mining assembly for rotating the same as it is advanced into a coal seam by operation of the carriage.

The mining assembly may include a boring head, indicated generally at 46, which may be of the general construction as shown in the above-mentioned Joy Patent No. 1,445,085, and the helical or auger conveyor sections, indicated generally at 47.

This boring or mining head may be in the form of a hollow cylinder open at both ends and provided at its forward end with the peripheral cutting bits 48 so as to cut a cylindrical kerf in a coal seam, and, as in usual practice in such mining heads, a center cutter 49 is carried thereby with suitable breaker means (not shown) within the cylinder, all as disclosed in detail in the above-mentioned Joy patent.

As best shown in Fig. 3, it will be seen that when the mining assembly is attached to the coupling 45 of the carriage the mining head 46 and conveyor sections 47 are substantially in contact with the bed plate 12 of the frame of the machine.

Thus, in order to use a larger diameter mining head than that shown in Fig. 3 the axis of the coupling 45 must therefore be located at a greater distance above the bed plate 12. In Fig. 3 the motor base 26 is in the lowest position. Therefore, the mining head shown in this figure is the smallest diameter of mining head to be used with this machine.

By raising the motor base 26 by manipulating jack screws 28 and 29 as above described, the coupling 45 will be correspondingly raised, so that mining assemblies of larger diameter may be used, depending upon the height to which the motor base is raised.

For the purpose of moving the carriage longitudinally upon the guideways of the frame, a pair of cooperating hydraulic cylinders 50 and 51 are provided. These two cylinders are rigidly tied together and adapted to float longitudinally as a unit during the operation of the machine.

For this purpose, transversely disposed bars 52 and 52a may be welded or otherwise secured to the cylinders 50 and 51 respectively, near opposite ends thereof, and are bolted or otherwise rigidly attached to a horizontal plate 53 located therebetween.

Spaced, vertical plates 54 are rigidly attached to opposite end portions of the plates 53 and extend downwardly on each side of the lower cylinder 51, having the outwardly disposed, horizontal flange members 55 fixed to their lower edge portions and slidable within the guideways 56 mounted upon the bed plate 12 of the frame of the machine. A piston 57 is mounted within the cylinder 50, the piston rod 58 thereof being connected as by the bracket 59 to the transverse vertical plate 60 upon the forward end of the carriage.

The cylinder 51 is provided with a similar piston, the piston rod 61 of which is attached to the rear portion of the frame of the machine as by the bracket 62 mounted upon the bed plate 12. Openings 63 and 64 are provided at opposite ends of the cylinder 50, and similar openings 65 and 66 are provided at opposite ends of the cylinder 51 to provide for admitting fluid to and discharging fluid from the cylinders.

As best shown in Figs. 3 and 4, the openings 63 and 65 of the cylinders 50 and 51 respectively, are connected by a pipe 67 through which fluid may be discharged from one cylinder to the other. Pipes 68 and 69 are connected to the openings 64 and 66 of the cylinders 50 and 51 respectively, and communicate with a pump or other source of fluid pressure.

The interior construction of each of the cylinders 50 and 51 is the same, and for the purpose of illustration only the cylinder 50 is shown in detail in Fig. 6. As shown in said figure, the piston rod 58 is slidable through a stuffing box 70 formed upon the cylinder head 71. The inner end of the piston rod 58 is shown as reduced and threaded at 72 for attachment of the piston 57 thereto.

For the purpose of by-passing oil through the piston 57, a double faced, conical valve 73 is located within the bore

74 in the piston and provided at opposite ends with the conical faces 75 and 76 for engagement with the valve seats 77 and 78 respectively, in opposite ends of the bore 74.

The bore 74 is provided with spaced, peripheral enlargements 79 allowing flow of oil around the valve 73 when it is in open position, as shown in Fig. 6. Axial stems 80 and 81 are provided at opposite ends of the valve 73 for contact with the head 82 of the piston to open the valve as shown in Fig. 6 and with the end of the stuffing box 70 respectively to open the valve 73 when the piston has moved to the opposite end of the cylinder.

In order to eliminate unwieldy hose for connecting the openings 64 and 66 of the two cylinders to the pump, a pair of double cylinders 83 and 84 is provided, these cylinders being rigidly connected to the horizontal plate 53 so as to be movable therewith.

The cylinder 83 is connected at its forward end to the opening 64 of the operating cylinder 50, as by the pipe 68, and the cylinder 84 is connected at its forward end to the opening 66 of the operating cylinder 51 by the pipe 69.

Open-ended cylinders 85 and 86 are slidably located within the cylinders 83 and 84, each of the open-ended cylinders 85 and 86 being connected at its rear end to the transverse, vertical plate 87 at the rear end of the frame and communicating respectively with the pipes 88 and 89 which lead to the pump or other source of fluid under pressure.

With the parts in the position shown in Figs. 3 and 4, in order to move the carriage forwardly, fluid under pressure from the pump or the like is admitted through the pipe 89 to the open-ended cylinder 86 and through the pipe 69 at the forward end of the cylinder 84 to the opening 66 in the forward end of the operating cylinder 51, to the right of the piston therein, the oil pressure immediately closing the valve in said piston corresponding to the valve 73 in Fig. 6, so that the fluid pressure will tend to force the piston in the cylinder 51 rearward or to the left, as viewed in Figs. 3 and 4.

The piston rod 61 thereof being fixed to the rear portion of the frame through the bracket 62, instead of moving the piston to the left or rearwardly, the cylinder 51 will be moved to the right or forwardly, moving the carriage forwardly.

As the cylinder 51 moves forwardly to its limit relative to its piston, the valve therein, corresponding to the valve 73 in Fig. 6, will be opened by contact of the valve stem with the end of the stuffing box in the cylinder 51, so that oil will then flow through said valve to the opening 65 of the cylinder 51 and through the pipe 67 to the opening 63 in the cylinder 50.

At this point the cylinder 50 and its piston are in the relative position shown in Fig. 6. Oil under pressure being admitted through the opening 63 to the left or rear of the piston 57 will immediately close the valve 73 upon the seat 77 and the oil pressure will then move the piston 57 to the right or forward continuing to move the carriage forwardly.

As the piston 57 reaches the limit of its forward or outward movement within the operating cylinder 50, the valve stem 81 will contact the end of the stuffing box 70, opening the valve 73 so that oil will pass there-through and be discharged through the opening 64 of the cylinder 50 to the pipe 68 and thence through the cylinder 83, open-ended cylinder 85 and pipe 88 to the pump.

At the forward end of its travel, with the pistons of both of the operating cylinders 50 and 51 moved outward to the limit relative to the respective cylinders, as above described, in order to retract the carriage, the flow of oil under pressure from the pump is reversed and admitted through the pipe 88, open-ended cylinder 85 and cylinder 83, and through the pipe 68 to the open-

ing 64 at the forward end of the operating cylinder 50, the oil pressure immediately closing the valve 73 in the piston 57 thereof and moving the piston 57 backward or to the left, to the position shown in Fig. 6.

At this time the valve stem 80 will contact the cylinder head 82 and open the valve 73 so that the oil under pressure will flow through said valve and be discharged from the cylinder 50 through the opening 63 thereof and through the pipe 67 to the opening 65 at the rear end of the cylinder 51. The oil pressure will immediately close the valve in the piston of the cylinder 51 and move the cylinder back to the position shown in Figs. 3 and 4, retracting the carriage to the rear position.

In the forward operation of the carriage, as above described, the mining assembly will have been rotated and advanced into a seam of coal. With the carriage retracted as above described, another auger section may be attached to the auger assembly and to the coupling 45 and the operation repeated until the mining assembly has been bored to the desired depth into the coal seam.

From the above it will be seen that a considerable advantage is obtained by providing for vertically adjusting the motor base upon the carriage so as to permit the machine to handle mining heads and conveyor sections of different diameters, thus eliminating the necessity of providing a separate machine for each diameter of mining assembly.

It will also be seen that the operating cylinders 50 and 51 provide very satisfactory means for continuously advancing or retracting the carriage during the mining operation, and that the fluid conveying cylinders 83 and 84 with the open-ended cylinders 85 and 86 therein, provide a very satisfactory means for conveying fluid to and from the operating cylinders as they travel longitudinally upon the frame, thus eliminating bulky hose which would otherwise be necessary.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby; the new and useful construction, and reasonable mechanical equivalents thereof of obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. Fluid pressure means for moving a carriage longitudinally upon an elongated frame, said fluid pressure means comprising a first fluid cylinder and a second fluid cylinder, said fluid cylinders being located parallel to each other and disposed longitudinally of the frame, means rigidly connecting said fluid cylinders together, pistons in said cylinders, piston rods connected to said pistons and being oppositely disposed relative to each other, means connecting the piston rod of the first cylinder to the frame, means connecting the piston rod of the second cylinder to the carriage, means alternately connecting the closed end of the first cylinder to a source of pressure fluid and a fluid return line, means alternately connecting the piston rod end of the second cylinder to a source of pressure fluid and a fluid return line, means providing communication between the other ends only of said cylinders, said last named means providing the only communication between the cylinders, a normally closed valve in each piston, each of said valves being freely movable in either direction and being normally closed by oil pressure there-against, and means operated only by movement of either

piston to either end of the corresponding cylinder for opening the valve therein to permit fluid to pass there-through from one side of the piston to the other side thereof.

2. Fluid pressure means for moving a carriage longitudinally upon an elongated frame, said fluid pressure means comprising a first fluid cylinder and a second fluid cylinder, said fluid cylinders being located parallel to each other and disposed longitudinally of the frame, means rigidly connecting said fluid cylinders together, pistons in said cylinders, piston rods connected to said pistons and being oppositely disposed relative to each other, means connecting the piston rod of the first cylinder to the frame, means connecting the piston rod of the second cylinder to the carriage, means alternately connecting the closed end of the first cylinder to a source of pressure fluid and a fluid return line, means alternately connecting the piston rod end of the second cylinder to a source of pressure fluid and a fluid return line, means providing communication between the other ends only of said cylinders, said last named means providing the only communication between the cylinders, there being a passageway through each piston, spaced valve seats in said passageway, a normally closed valve in said passageway, said valve being freely movable in either direction and being normally closed by oil pressure thereagainst, and oppositely disposed stems upon the valve for contact with opposite ends of the cylinder for opening the valve to permit fluid to pass through the passageway from one side of the piston to the other side thereof.

3. Fluid pressure means for moving a carriage longitudinally upon an elongated frame, said fluid pressure means comprising a first fluid cylinder and a second fluid cylinder, said fluid cylinders being located parallel to each other and disposed longitudinally of the frame, means rigidly connecting said fluid cylinders together, pistons in said cylinders, piston rods connected to said pistons and being oppositely disposed relative to each other, means connecting the piston rod of the first cylinder to the frame, means connecting the piston rod of the second cylinder to the carriage, means alternately connecting the closed end of the first cylinder to a source of pressure fluid and a fluid return line, means alternately connecting the piston rod end of the second cylinder to a source of pressure fluid and a fluid return line, means providing communication between the other ends only of said cylinders, said last named means providing the only communication between the cylinders, there being a passageway through each piston, spaced peripheral enlargements communicating with said passageway, spaced valve seats in said passageway, a normally closed valve in said passageway, said valve being freely movable in either direction and being normally closed by oil pressure there-

against, and oppositely disposed stems upon the valve for contact with opposite ends of the cylinder for opening the valve to permit fluid to pass through the spaced peripheral enlargements of said passageway from one side of the piston to the other side thereof.

4. Fluid pressure means for moving a carriage longitudinally upon an elongated frame, said fluid pressure means comprising a first fluid cylinder and a second fluid cylinder, said fluid cylinders being located parallel to each other and disposed longitudinally of the frame, means rigidly connecting said fluid cylinders together, pistons in said cylinders, piston rods connected to said pistons and being oppositely disposed relative to each other, means connecting the piston rod of the first cylinder to the frame, means connecting the piston rod of the second cylinder to the carriage, means alternately connecting the closed end of the first cylinder to a source of pressure fluid and a fluid return line, means alternately connecting the piston rod end of the second cylinder to a source of pressure fluid and a fluid return line, said means for alternately connecting said ends of the first cylinder and second cylinder to a source of pressure fluid and a fluid return line including a pair of fluid conveying cylinders movable with said first and second fluid cylinders and an open-ended cylinder slidable within each fluid conveying cylinder, means providing communication between the other ends only of said cylinders, said last named means providing the only communication between the cylinders, a normally closed valve in each piston, each of said valves being freely movable in either direction, and being normally closed by oil pressure thereagainst, and means operated only by movement of either piston to either end of the corresponding cylinder for opening the valve therein to permit fluid to pass therethrough from one side of the piston to the other side thereof.

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