Nov. 16, 1954 C. L. EVANS 2,694,384

CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

Filed June 21, 1949 7 Sheets-Sheet 1

Fig. 1.

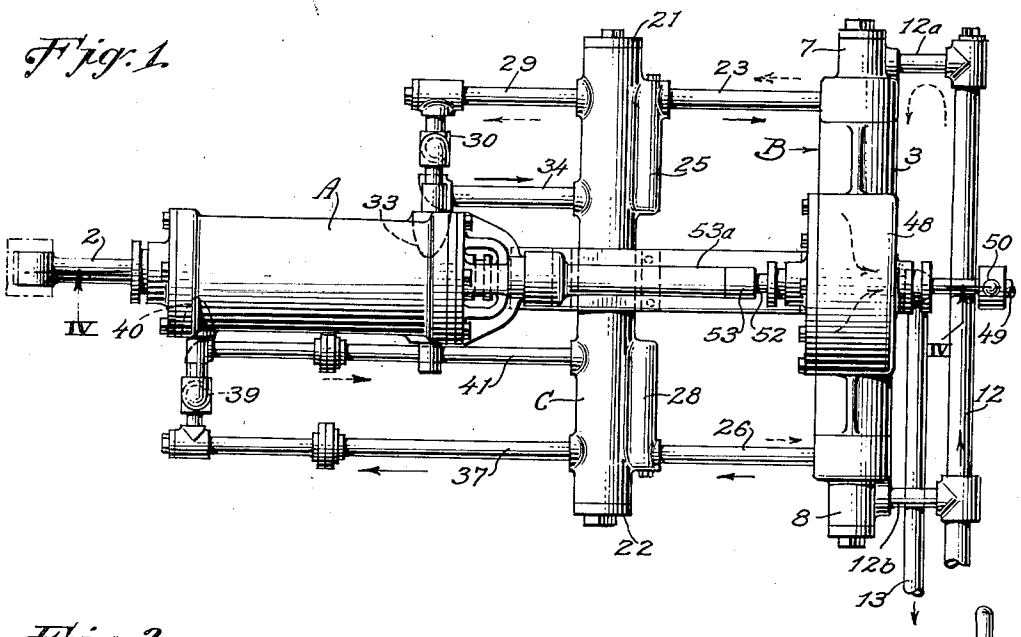


Fig. 2.

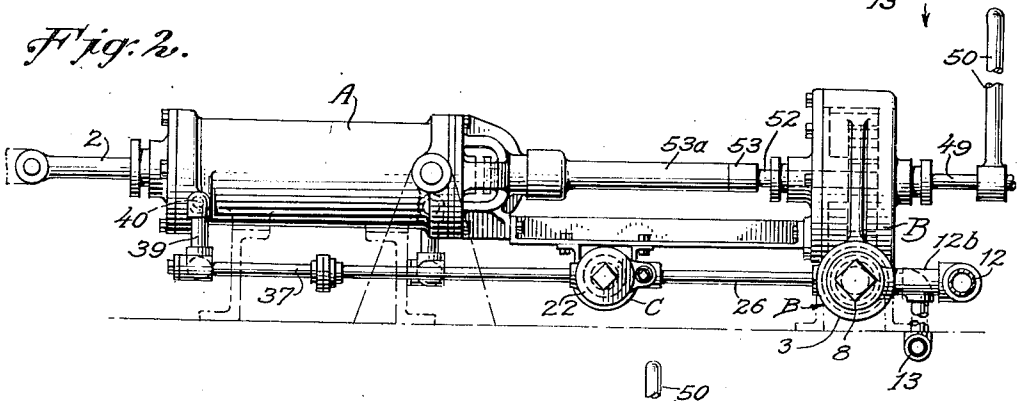
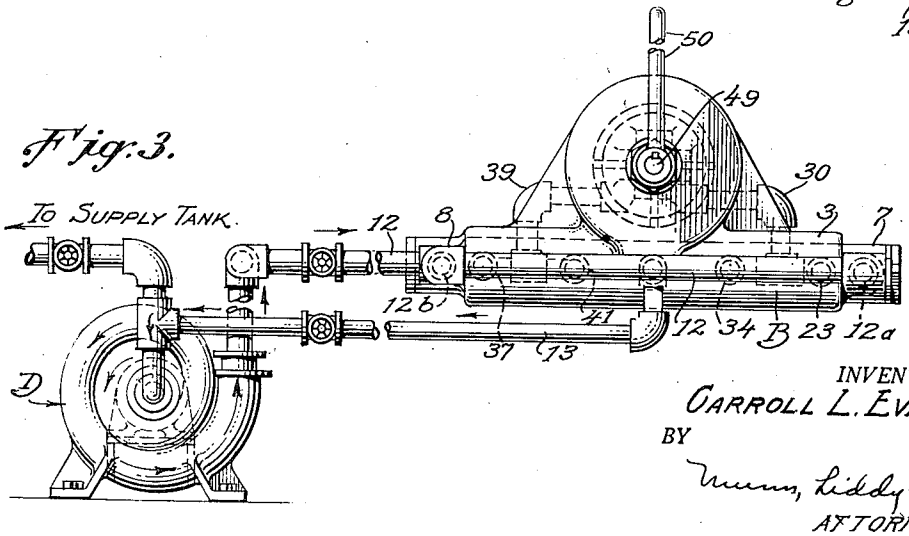


Fig. 3.



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CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

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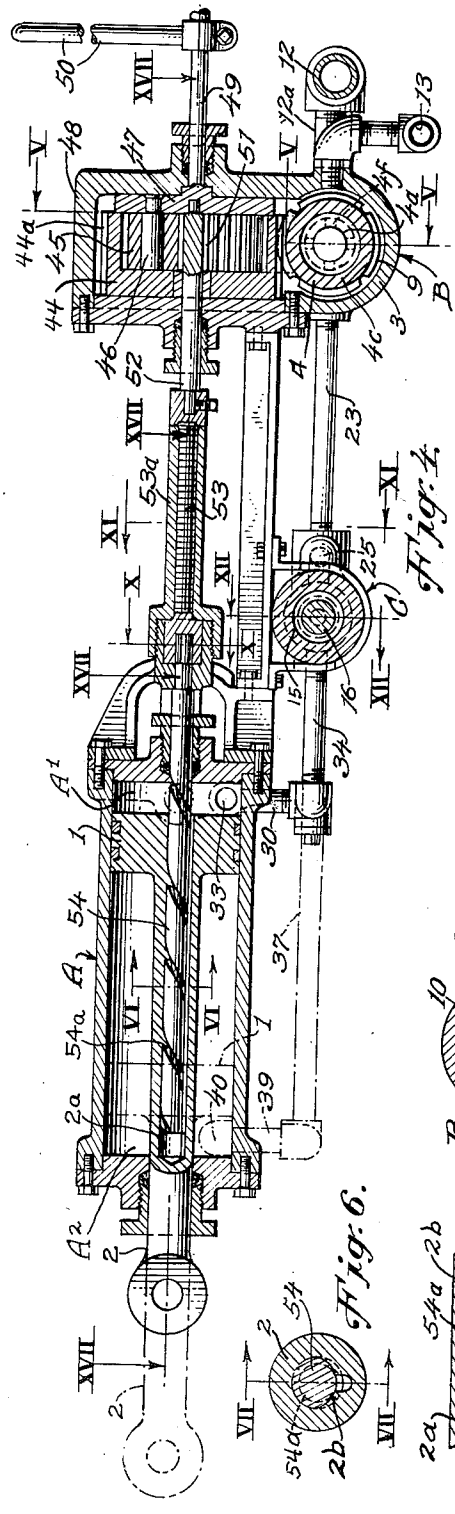

Fig. 4.

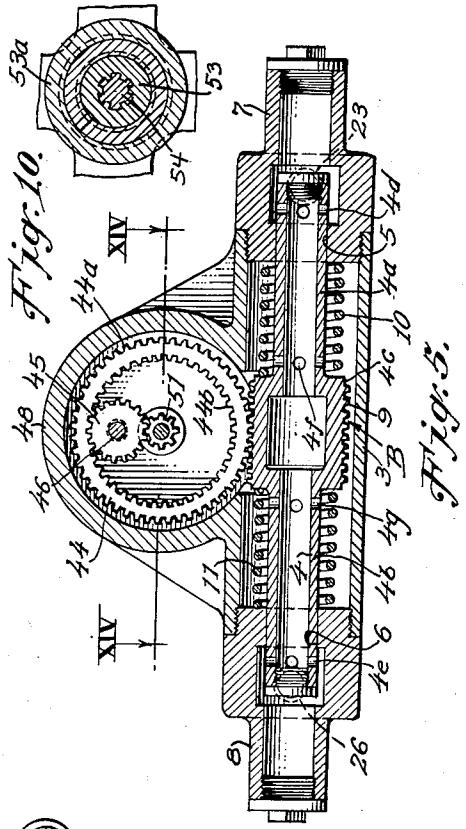

Fig. 5.

Fig. 10.

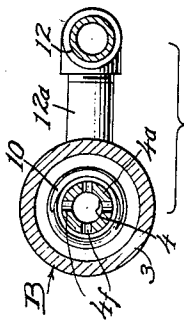

Fig. 8.

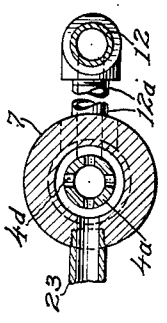

Fig. 9.

Fig. 6.

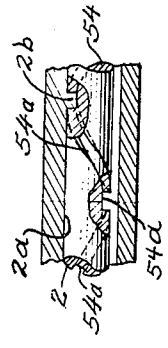

Fig. 7.

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CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

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Fig. 11.

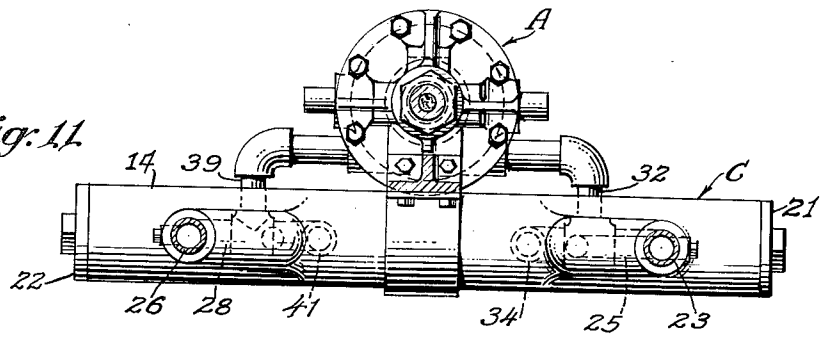


Fig. 12.

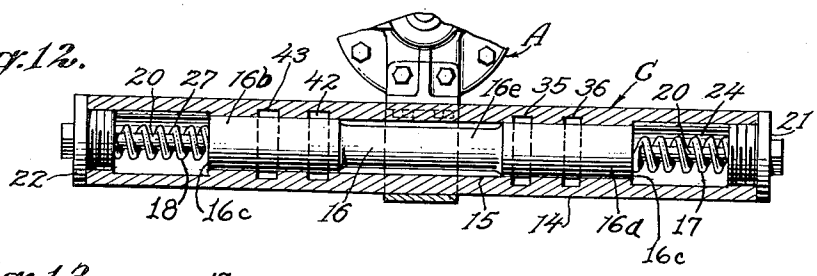


Fig. 13.

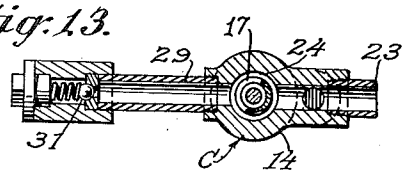


Fig. 15.

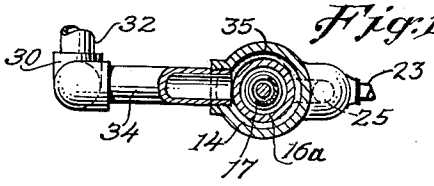
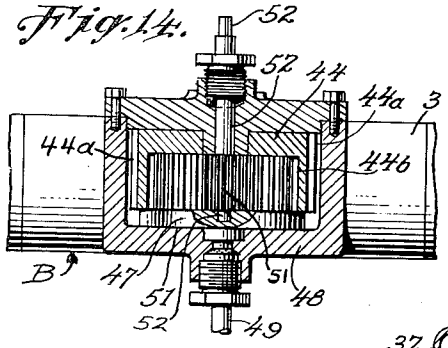


Fig. 14.



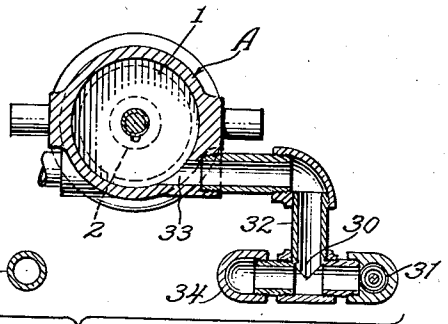


Fig. 16.

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CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

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Fig. 17.

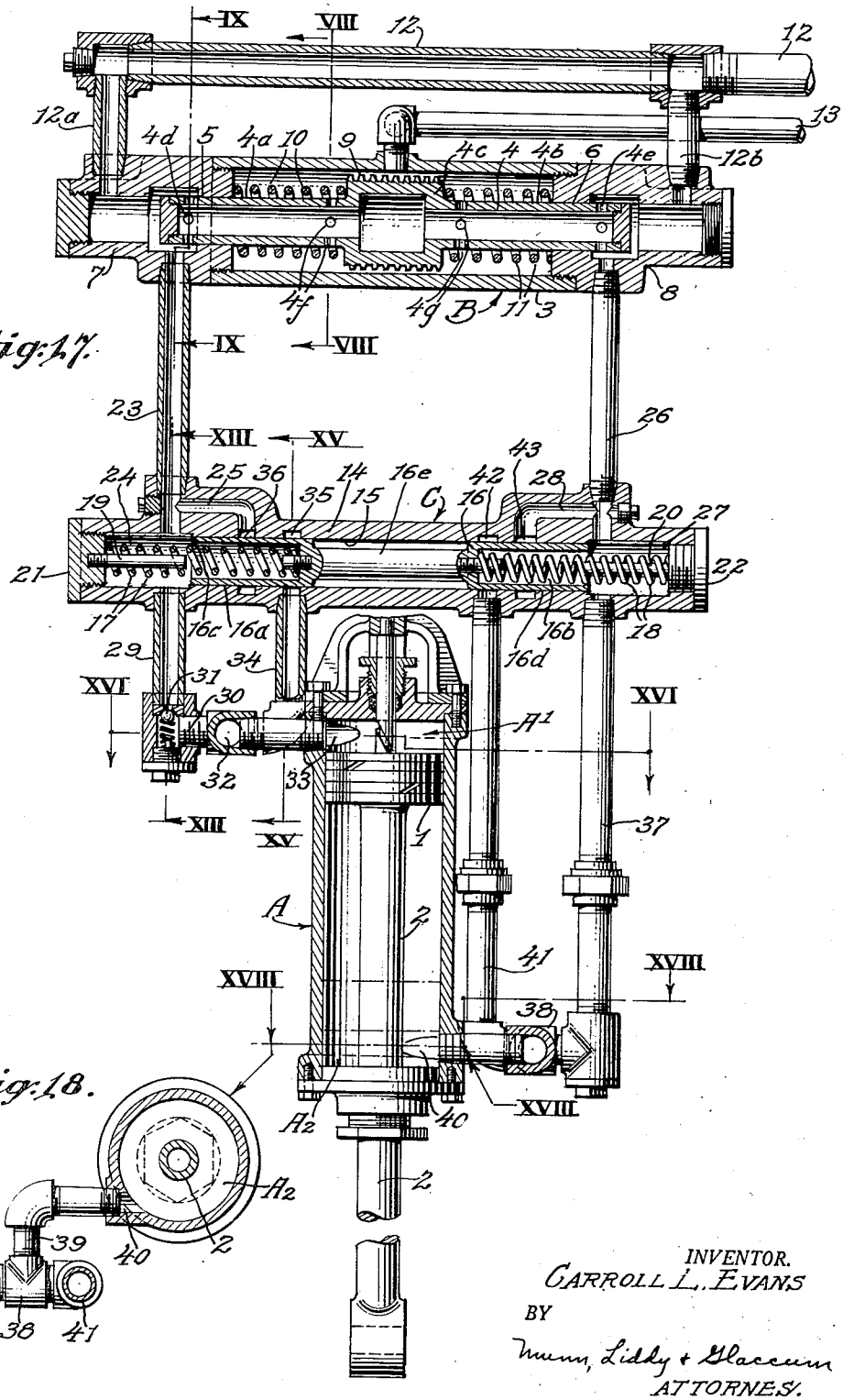

Fig. 18.

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CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

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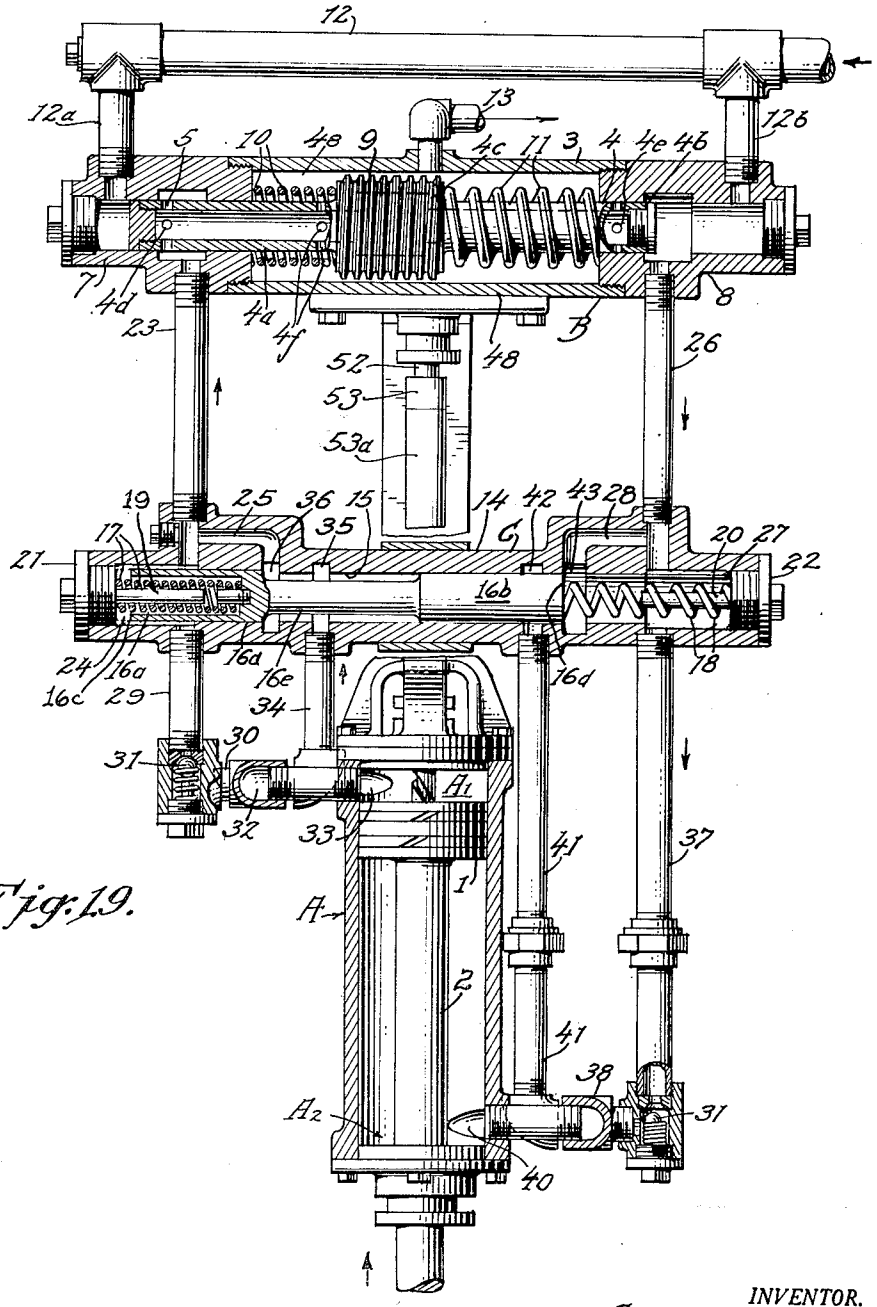

Fig. 19.

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CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

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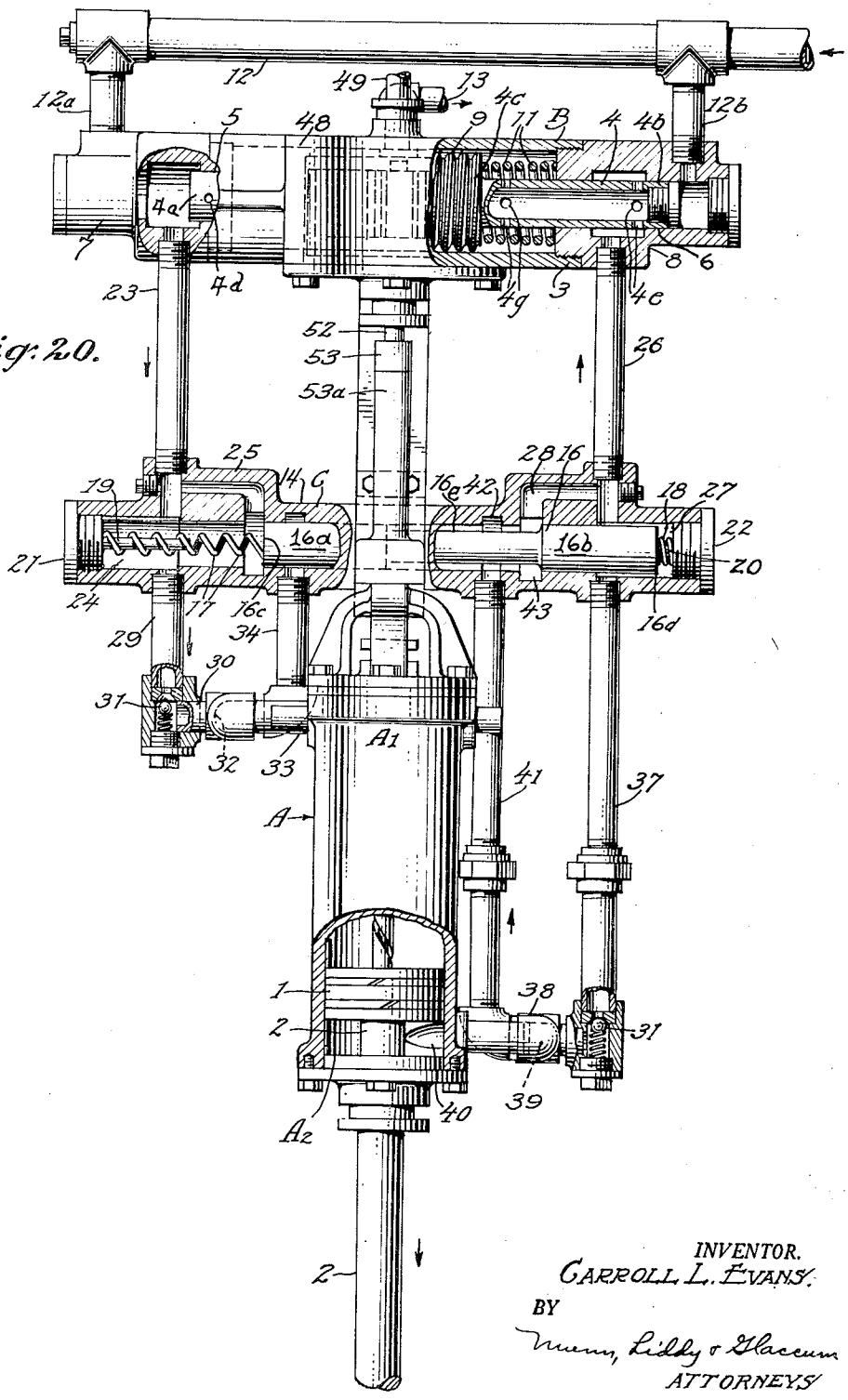
Fig. 20.



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CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

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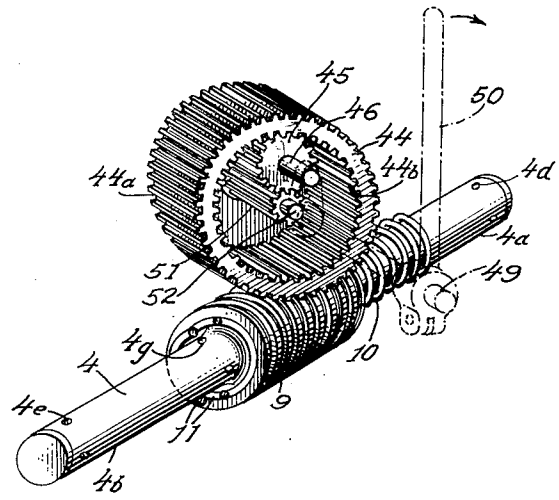
Fig. 2.



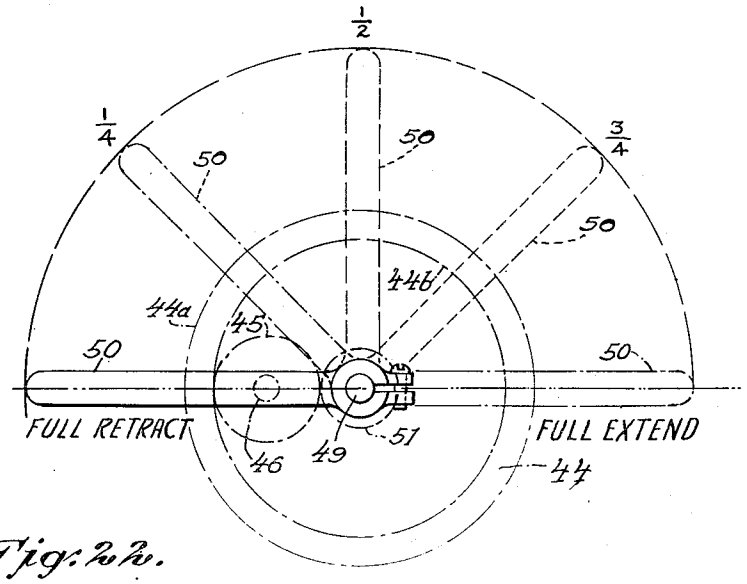


Fig. 2a.

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United States Patent Office 2,694,384 Patented Nov. 16, 1954

2,694,384

CONTROL MECHANISM FOR HYDRAULIC RAMS WITH AUTOMATIC AND ADJUSTABLE SELF-STOPPING MECHANISM

Carroll L. Evans, Tipton, Calif.

Application June 21, 1949, Serial No. 100,451

6 Claims. (Cl. 121—40)

An object of my invention is to provide a control mechanism for hydraulic rams in which a control lever can be moved into any desired position between its extreme limits of movement and will cause the piston rod of the hydraulic ram to move accordingly and to stop at the position indicated by the lever. When the lever is in one extreme position of its movement, the piston rod will be fully retracted and when the lever is in its other extreme position of movement, the piston rod will be fully extended.

A further object of my invention is to provide a device of the type described which is relatively simple in construction and is durable and efficient for the purpose intended.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming a part of this application, in which:

Figure 1 is a top plan view of the device;

Figure 2 is a side elevation;

Figure 3 is an end view when looking at the right hand end of Figure 1;

Figure 4 is a longitudinal section taken substantially along the line IV—IV of Figure 1;

Figure 5 is a transverse section taken along the line V—V of Figure 4 and illustrates the hand-controlled valve;

Figure 6 is a transverse section taken along the line VI—VI of Figure 4 and shows the helically-grooved shaft in the bore of the piston rod;

Figure 7 is a longitudinal section taken substantially along the line VII—VII of Figure 6 and illustrates in detail how the helically-grooved shaft is operatively connected to the piston rod;

Figure 8 is a longitudinal section taken along the line VIII—VIII of Figure 17 and shows a transverse section of the hand-controlled valve;

Figure 9 is a longitudinal section taken along the line IX—IX of Figure 17 and illustrates a transverse section of one of the end headers associated with the hand-controlled valve;

Figure 10 is a transverse section taken along the line X—X of Figure 4 and shows the connection between the helically-grooved shaft and a flexible shaft;

Figure 11 is a transverse section taken along the line XI—XI of Figure 4 and shows the automatic valve in elevation;

Figure 12 is a transverse section taken along the line XII—XII of Figure 4 and shows a longitudinal section through the automatic valve;

Figure 13 is a longitudinal section taken along the line XIII—XIII of Figure 17 and shows a transverse section through the automatic valve;

Figure 14 is a horizontal section taken substantially along the line XIV—XIV of Figure 5 and shows the control gearing for the hand-operated valve;

Figure 15 is a longitudinal section taken along the line XV—XV of Figure 17 and shows another transverse section through the automatic valve;

Figure 16 is a transverse section taken along the line XVI—XVI of Figure 17 and shows a transverse section through one end of the cylinder of the hydraulic ram;

Figure 17 is a horizontal section taken along the line XVII—XVII of Figure 4 and illustrates the control mechanism in its relation to the hydraulic ram;

Figure 18 is a transverse section taken along the line XVIII—XVIII of Figure 17 and shows a transverse section through the opposite end of the hydraulic ram cylinder from that of Figure 16;

Figure 19 is a view similar to Figure 17 and shows the parts in position for retracting the piston rod;

Figure 20 is the same as Figure 17 and shows the parts in a position for extending the piston rod;

Figure 21 is an isometric view of the control gears for the hand-operated valve; and

Figure 22 is a schematic view illustrating the various positions of the control lever that operates the hand-operated valve.

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit and scope of the invention.

In carrying out my invention I provide a hydraulic ram cylinder A in which is mounted a piston **1** and the piston moves a piston rod **2**, the latter projecting from one end of the cylinder. The piston rod may be connected to any mechanism desired for operating it, none being shown.

I provide a manually controlled valve indicated generally at B, see Figure 17, and an automatic valve indicated generally at C for controlling the movement of the hydraulic ram so as to move the piston rod **2** outwardly or inwardly as desired and to hold the rod in any predetermined position between the limits of its stroke. It is best to first describe the structure of the manually controlled valve B and then the structure of the automatic valve C after which the passages placing these valves in communication with each other and with the hydraulic ram A will be set forth. This will be followed by a brief description of the operation of the entire mechanism.

Manually controlled valve B

The manually controlled valve B is shown in transverse and horizontal sections in Figures 4 and 17. A housing **3** encloses a hollow valve body **4** and this body has cylindrical ends **4***a* and **4***b* which are slidably received in bores **5** and **6** provided in end headers **7** and **8**, respectively. The central portion of the valve body **4** is enlarged at **4***c*, see Figure 5, and the outer surface of this enlarged portion is provided with ring-shaped teeth to form a rack **9**. Coil springs **10** and **11** are interposed between the enlarged central portion **4***c* and the adjacent ends of the headers **7** and **8**, and the springs encircle the cylindrical ends **4***a* and **4***b* so as to yieldingly hold the hollow valve body **4** in the center or neutral position illustrated in Figure 17.

A fluid inlet pipe **12** has a branch **12***a* communicating with the interior of the end header **7**, see Figure 9, and has a second branch **12***b* communicating with the interior of the other header **8**. The cylindrical ends **4***a* and **4***b* of the hollow valve body **4** have inlet openings **4***d* and **4***e* so the fluid can flow from the end headers **7** and **8** into the interior of the hollow valve body **4**. Near the center of the valve body **4** I provide outlet openings **4***f*, see Figure 8, and **4***g* through which the fluid can flow from the hollow valve body into the interior of the housing **3**. A return pipe **13** for the fluid communicates with the housing **3** and conveys the fluid back to the source from which the fluid was originally pumped, such as the pump D shown in Figure 3.

It will be seen from this construction that so long as the valve body **4** remains in the position shown in Figure 17, fluid will flow under pressure from its source, the pump D, and enter both the end headers **7** and **8** and then pass into the hollow valve **4** and thence into the housing **3**, and finally into the return pipe **13** where it will be conveyed back to the pump. So long as the hollow valve remains in neutral position this flow will continue and the mechanism hereinafter described will not be operated and therefore the piston **1** will remain stationary.

Before describing the manually controlled gearing mechanism for shifting the hollow valve body **4**, it is best to set forth the structure of the automatic valve C. The automatic valve is illustrated in Figure 17.

Automatic valve C

The automatic valve C comprises a casing **14**, see Figure 17, and this casing has a bore **15** in which a valve

body 16 is reciprocably mounted. The valve body has enlarged and recessed ends 16*a* and 16*b* in which the ends of coil springs 17 and 18 are received. The outer ends of the springs are mounted on guide rods 19 and 20, see Figure 12, and these rods in turn are carried by removable caps 21—22 that close the ends of the valve casing 14. A pipe 23 extends from the header 7 to an enlarged compartment 24, see Figure 13, in which the end 16*c* of the valve moves. A by-pass 25 communicates with the branch pipe 23 and is normally closed at its other end by the enlarged valve end 16*c*. Another pipe 26 communicates with the header 8 and with an enlarged compartment 27, see Figure 17, provided in the right hand end of the valve casing 14. A by-pass 28, see Figure 11, communicates with the pipe 26 and has its other end normally closed by the enlarged right hand end 16*b* of the valve body 16. When the parts are shown in the position as in Figure 17, fluid under pressure can flow from the headers 7 and 8 into the pipes 23 and 26 and thence into the compartments 24 and 27.

Again referring to Figures 16 and 17, it will be noted the pipe 29 leads from the compartment 24 to a T-shaped passageway indicated generally at 30. A check valve 31, see also Figure 13, permits fluid under pressure to flow from the pipe 29 into the T-shaped passageway, but prevents the return flow of the fluid. The stem 32 of the T-shaped passageway 30 extends vertically as shown in Figure 16 and communicates with a port 33 in one end of the cylinder A. Under certain conditions, fluid flowing through the pipe 29 will pass the check valve 31 and enter one end of the cylinder A by means of the port 33 and will move the piston 1 and cause the piston rod 2 to be projected from the cylinder.

The return movement of the piston 1 caused by a mechanism yet to be described will force the trapped fluid in the cylinder end A1 out through the port 33 and back into the T-shaped passageway 30. The check valve 31, see Figures 13 and 17, will prevent the fluid from returning through the pipe 29 and instead, a by-pass 34, see Figures 16 and 17, is provided and which communicates with the T-shaped passage 30 and leads to an annular recess 35 provided in the valve casing 14. This recess is placed in communication with a second annular recess 36 when the valve body 16 is moved to the left in Figure 17 and to the right in Figure 12, and brings the enlarged end 16*c* out of registration with the annular recesses 35 and 36. A reduced central portion 16*e* when moved opposite the recesses 35 and 36 permits intercommunication between them so that the fluid returning from the end A1 of the cylinder A will pass into the valve casing 14 through the pipe 34 and then enter the by-pass 25 which communicates with the recess 36 and with the pipe 23, the latter now constituting a return flow pipe for the fluid. Figure 15 shows a portion of the T-shaped passage 30 with the vertical stem of the T being indicated at 32 and the by-pass pipe 34 communicating with the T-shaped passage as shown. The same figure also shows the valve casing 14 with the annular recess 35 receiving the fluid from the by-pass 34. The other by-pass 25 is also indicated.

Access to the end A2 of the cylinder is by a pipe 37 that communicates with the compartment 27 and has its other end communicating with another T-shaped passageway 38, see Figures 17 and 18. This T has a vertically extending stem 39 that is in communication with a port 40 that communicates with the end A2 of the cylinder A. Fluid flowing through the pipe 37 to the cylinder will enter the port 40 and force the piston 1 from the dot dash line position shown in Figure 17 toward the full line position illustrated in the same figure. When the piston is returned from the end A1 to the end A2, the trapped fluid will exit through the port 40 and instead of passing through the T 38 and into the pipe 37, the fluid will be diverted to a return pipe 41 shown in Figures 17 and 18. The T-shaped passageway 38 has a check valve therein which will prevent the fluid returning from the cylinder A from entering the pipe 37, but will cause this fluid to enter the pipe 41.

The pipe 41 communicates with an internal annular recess 42 in the valve casing 14. The by-pass 28 communicates with a second internal annular recess 43 and both of these recesses are uncovered when the valve body 16 is moved to the right in Figure 17 so as to move the end 16*b* away from the recesses 42 and 43. The reduced portion 16*e* of the valve when brought into registration with the recesses will permit fluid flowing from the end A2 of the cylinder to pass through the pipe 41 and enter the valve casing 14 and then pass through the by-pass 28 and enter the pipe 26 which now becomes a return pipe. When the valve body 16 is in the neutral position shown in Figure 17, the end 16*b* will close the annular recess 42 and trap the fluid in the pipe 41 and any fluid that is in the cylinder end A2. The piston 1 will remain in the position into which it has been moved. The valve body 4 must be shifted to cause the fluid to move the piston.

It is best now to describe the manually controlled mechanism for shifting the hollow valve body 4 from its neutral position shown in Figure 17 into a left hand position as shown in Figure 19, or into a right hand position as shown in Figure 20. In Figures 4 and 5 as well as Figure 21, I show the hollow valve body 4 having its central ring-shaped rack 9 in mesh with a ring gear indicated generally at 44. This gear has external teeth 44*a* on its outer surface that mesh with the rack 9, see Figures 5 and 21. The ring gear also has internal teeth 44*b* on its inner surface and these teeth are in mesh with a pinion 45. Figure 4 shows the pinion 45 as being mounted on a stub shaft 46 which is carried by a disc 47, the disc in turn being rotatably mounted in a gear housing 48 that forms a part of the housing 3 and extends upwardly therefrom. The disc 47 is rotated by a shaft 49, see Figure 4, and this shaft may be rotated by a hand lever 50. In Figure 21 the hand lever is indicated by dot dash lines and so is likewise the shaft 49. A swinging of the hand lever 50 to the right as indicated by the arrows in Figure 21 will rotate the disc 47 and carry the stub shaft 46 therewith.

It will also be seen from Figures 4, 5 and 21 that the pinion 45 meshes with a splined end portion 51 of a shaft 52. The shaft 52 projects beyond the housing 48 as shown in both Figures 4 and 14 and it is rigidly connected to a flexible shaft 53. The flexible shaft 53 is splined to a shaft 54 that has a helical groove 54*a* therein, see Figures 6 and 7. The shaft 54 is received in a bore 2*a* provided in the piston rod 2. The bore has an inwardly extending helical rib 2*b* that is received in the helical groove 54*a* provided in the shaft 54. The particular construction of the piston rod 2 and the shaft 54 with the helical groove 54*a* is shown in the detailed sectional views of Figures 6 and 7. The structure is such that after the lever 50 has been swung into a certain position to move the hollow valve body 4 to the right or to the left in Figure 5, the fluid under pressure will move the piston 1 into the position indicated by the initial movement of the handle 50 and the movement of this piston will transmit a rotational movement to the helically-grooved shaft 54. The shaft 54 is directly connected to the shaft 52 by the flexible shaft 53 and therefore the splined end 51 of the shaft 52 will be rotated to rotate the pinion 45, see Figure 5, and rotate the ring gear 44 to return the valve body 4 to neutral position. A casing 53*a* may house the flexible shaft as shown in Figure 4.

Operation

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

In Figure 22, I show a diagrammatic view of how the hand lever 50 can be swung into different positions to effect different movements of the piston and piston rod. Assume that the hand lever 50 is to be swung from the full line position (Full Retract), shown in Figure 22, to the dot dash line position (Full Extend). The piston 1 will be moved so as to move the piston rod from fully retracted position into fully extended position. A swinging of the lever 50 from the fully retracted position through 180 degrees to the fully extended position, will cause the pinion 45 to be swung to the right in Figure 21. The pinion will mesh and ride on the splined portion 51 of the shaft 52 and therefore the pinion 45 will be rotated in a clockwise direction when looking at Figure 21 and will rotate the ring gear 44 also in a clockwise direction. The rotation of the ring gear will shift the hollow valve body 4 to the left in Figure 21 and to the right in Figure 20.

Fluid under pressure will now flow from the fluid in the pipe 12 through the branch pipe 12*a* and into the end header 7. The movement of the hollow valve body

4 to the right in Figure 20 will cause the openings 5 disposed at the left hand end of the body to be covered so that no fluid can enter the hollow body, but instead this fluid is forced to flow along the pipe 23. The fluid will enter the compartment 24 shown in section in Figure 17 and will actuate the automatically moved valve body 16 so as to move this body to the right in Figure 20 and compress the coil spring 18. The enlarged end 16c of the valve 16 will move the reduced portion 16e into registration with the annular recesses 42—43. The fluid under pressure will pass through the compartment 24 into the pipe 29, see Figure 20, and then past the check valve 31 into the T shown at 30 in Figure 16. From here the fluid will enter the cylinder A through the port 33 and will move the piston 1 outwardly to extend the piston rod 2 from the cylinder end.

The movement of the piston 1 by the fluid is substantially instantaneous with the swinging of the lever 50. As the piston moves outwardly, it will actuate the helically-grooved shaft 54 to rotate the shaft in a direction that will rotate the splined end 51 of the shaft 52 in a clockwise direction when looking at Figure 21. Such a rotative movement of the splined end 51 will impart rotation to the pinion 45 in a counter-clockwise direction and will cause the ring gear 44 to rotate in a counter-clockwise direction. This movement will act upon the rack 9 to move the hollow valve body 4 to the right in Figure 21 and to the left in Figure 20. The result is that the initial movement of the ring gear 44 caused by the swinging of the lever 50 to the right in Figure 21 will be offset by a rotation of the ring gear 44 caused by the piston 1 rotating the splined end 51 of the shaft 52 by the interconnecting flexible shaft 53. Therefore, the hollow valve body 4 will be maintained in the position shown in Figure 20 so long as the hand lever 50 is continuously moved from the "full retract" position shown in Figure 22 into the "full extend" position shown in the same figure. The piston 1 will not be stopped at any particular position in the cylinder A during this movement.

The fluid trapped ahead of the piston 1 in the cylinder A will flow out through the port 40 in Figure 20 and will be prevented from entering the branch pipe 37 by the check valve 38 and instead will enter the return pipe 41. The fluid will flow into the annular recess 42 and since this recess is uncovered by the reduced portion 16e of the valve, the fluid will immediately flow into the annular recess 43 and enter the by-pass 28 where it will return through the pipe 26 to the right hand header 8. The hollow valve 4 has cut off communication to the branch pipe 12b and therefore the fluid will enter the hollow valve through the ports 4e and will exit from the hollow valve through the ports 4g. Here the fluid enters the housing 3 and passes through the return pipe 13 back to the pump D.

It will be understood that the piston 1 may be stopped at any position along its travel in the cylinder A by merely moving the lever 50 to any desired point between the "full retract" position to the "full extend" position indicated in Figure 22. By dotted lines I have shown the ¼, ½ and ¾ positions for the lever 50 in this figure. If the lever should be stopped at any one of these positions or any intermediate position, the hollow valve body 4 will be returned to normal position shown in Figure 17 as soon as the piston 1 reaches the position indicated. When this occurs, the valve body 16 of the automatic valve C will be returned to neutral position and the end 16b will close the annular recess 42 and trap the fluid in the pipe 41 and in the cylinder end A2. The piston 1 will therefore be stopped from further movement.

Figure 19 illustrates the positions of the hollow valve body 4 and the automatic valve 16 when the lever 50 is moved from "full extend" position to "full retract" position. The arrows in this figure illustrate the flow of the fluid through the various parts of the mechanism and it is not deemed essential to set forth the fluid flow in detail since it is just the reverse from that shown in Figure 20. It will be seen from the construction that the operator has complete control of the piston and the piston rod and can move both into any desired position and hold them in this position as long as he wishes.

I claim:

1. A device of the type described comprising a cylinder having a port at each end; a piston slidable in the cylinder, a piston rod connected to the piston and extending from one end of the cylinder; means for circulating a fluid under pressure through a conduit; a manually controlled valve placed in the conduit and including a valve casing and a main valve body reciprocably mounted in the casing; a conduit leading from one end of the valve casing to one of the cylinder ports; a second conduit leading from the other end of the valve casing to the other cylinder port; a second valve casing having its ends in communication with intermediate portions of the conduits; by-pass conduits leading from each cylinder port to said second valve casing; a lever for moving the main valve body being swingable into various positions for causing fluid to flow into either one of the first two mentioned conduits for entering one of the cylinder ports and moving the piston into a desired position in the cylinder; the fluid on the other side of the piston constituting a trapped fluid and passing through the other cylinder port and thence flowing through the by-pass conduit associated with this port, back to the second valve casing; an automatically movable valve body placed in the second valve casing and being moved by the fluid flowing through either one of the first two mentioned conduits that communicates with the cylinder; the moved automatic valve body placing the by-pass conduit receiving the trapped fluid in communication with the conduit portion not at the moment being used for conveying the fluid to the cylinder; whereby the trapped fluid will be conveyed back to the manually controlled valve; and means actuated by the moving piston for returning the manually controlled valve body back to neutral position when the piston and piston rod reach the desired position indicated by the lever; said manually controlled valve body when in neutral position directing fluid through both of the first two mentioned conduits to both ends of the second valve casing for returning the automatic valve to neutral position; the latter valve shutting off any flow of fluid through the by-pass conduits; whereby the piston will remain in the position into which it has been moved.

2. A device of the type described comprising a hydraulic ram including a cylinder having a port at each end, a piston and a piston rod; a control mechanism for the hydraulic ram including a valve casing having a fluid entrance at each end and an outlet placed between the ends; means for forcing a fluid under pressure into both ends of the valve casing; a hollow valve body reciprocably mounted in the casing and when in neutral position receiving fluid from both casing ends, and delivering it to said outlet; said fluid moving means receiving the fluid from said outlet; a conduit leading from one end of the valve casing to an inlet port in the cylinder; a second conduit leading from the other end of the valve casing to the other inlet port in the cylinder; a second valve casing having its ends in communication with intermediate portions of said conduits; by-pass conduits leading from each cylinder port to said second valve casing; said second valve casing having by-pass passages placing the by-pass conduits in communication with the first and second named conduits; an automatically movable valve body placed in the second valve casing; spring means for yieldingly holding the automatic valve body in neutral position, a lever for shifting the hollow valve body for permitting fluid to flow through only one of the conduits from the fluid moving means, the fluid in the conduit moving the automatic valve body and also moving the piston, the fluid trapped in the cylinder portion disposed on the other side of the piston flowing through the by-pass conduit communicating with this portion; the moved automatic valve body placing the by-pass conduit receiving the trapped fluid in communication with the by-pass passage that connects with the conduit that conveys the fluid back to the first valve casing.

3. A device of the type described comprising a hydraulic ram including a cylinder having a port at each end, a piston and a piston rod; a control mechanism for the hydraulic ram including a valve casing having a fluid entrance at each end and an outlet placed between the ends; means for forcing a fluid under pressure into both ends of the valve casing; a hollow valve body reciprocably mounted in the casing and having ends cutting off the fluid flow through the casing from the entrance ends to the outlet; the valve body when in neutral position having ports for fluid to flow into the valve body from the casing ends and out from the valve body into

the casing portion communicating with the casing outlet; said fluid moving means receiving the fluid from said outlet; a conduit leading from one end of the valve casing to an inlet port in the cylinder; a second conduit leading from the other end of the valve casing to the other inlet port in the cylinder; a second valve casing having its ends in communication with intermediate portions of said conduits; by-pass conduits leading from the cylinder ports to said second valve casing; said second valve casing having by-pass passages leading to the first mentioned conduits that communicate with the first valve casing; an automatically movable valve body reciprocably mounted in the second valve casing; yielding means normally holding the automatic valve in neutral position where the first mentioned conduits will be in direct communication with both ends of the cylinder; a lever for moving the hollow valve to close off the fluid flow from one end of the valve casing into the hollow valve whereby the fluid will flow through the conduit associated with the same valve casing end and will move the piston and the automatic valve; the automatic valve placing the by-pass conduit communicating with the cylinder end containing the trapped fluid in communication with the by-pass passage for permitting the trapped fluid to return to the first mentioned valve casing, the hollow valve body having its ports arranged to receive the trapped fluid and deliver it to the outlet; and check valves placed in the first named conduits near the by-pass conduits for directing fluid trapped in the cylinder, into the by-pass conduits.

4. A device of the type described comprising a hydraulic ram including a cylinder having a port at each end, a piston and a piston rod; a control mechanism for the hydraulic ram including a valve casing having a fluid entrance at each end and an outlet placed between the ends; means for forcing a fluid under pressure into both ends of the valve casing; a hollow valve body reciprocably mounted in the casing and having ends cutting off the fluid flow through the casing from the entrance ends to the outlet; the valve body when in neutral position having ports for fluid to flow into the valve body from the casing ends and out from the valve body into the casing portion communicating with the casing outlet; said fluid moving means receiving the fluid from said outlet; a conduit leading from one end of the valve casing to an inlet port in the cylinder; a second conduit leading from the other end of the valve casing to the other inlet port in the cylinder; a second valve casing having its ends in communication with intermediate portions of said conduits; by-pass conduits leading from the cylinder ports to said second valve casing; said second valve casing having by-pass passages leading to the first mentioned conduits that communicate with the first valve casing; an automatically movable valve body reciprocably mounted in the second valve casing; yielding means normally holding the automatic valve in neutral position where the first mentioned conduits will be in direct communication with both ends of the cylinder; a lever for moving the hollow valve to close off the fluid flow from one end of the valve casing into the hollow valve whereby the fluid will flow through the conduit associated with the same valve casing end and will move the piston and the automatic valve; the automatic valve placing the by-pass conduit communicating with the cylinder end containing the trapped fluid in communication with the by-pass passage for permitting the trapped fluid to return to the first mentioned valve casing, the hollow valve body having its ports arranged to receive the trapped fluid and deliver it to the outlet; and check valves placed in the first named conduits near the by-pass conduits for directing fluid trapped in the cylinder, into the by-pass conduits, and means actuated by the moving piston for moving the hollow valve body back into neutral position when the piston reaches a position in the cylinder corresponding to the position of the lever.

5. The combination with a hydraulic ram having a cylinder, a piston reciprocably mounted therein, and a piston rod actuated by the piston, of a control mechanism for the ram and including a main passage through which a fluid under pressure is constantly flowing, a first branch passage leading from the main passage to one end of the ram cylinder, a second branch passage leading from the main passage to the other end of the cylinder, a hollow manually controlled main valve in the main passage for directing fluid through the desired branch passage to the desired end of the cylinder for moving the piston and rod in the desired direction when the valve is actuated, fluid return passages communicating with each end of the cylinder, an automatic valve disposed adjacent to the cylinder and having an automatically movable member; area means on the automatically movable valve member exposed to the pressure of the fluid in the branch passages so that upon building up of pressure in one branch passage the automatically movable valve member is shifted, thereby placing the return passage through which fluid is flowing in communication with the branch passage not being used for feeding fluid to the cylinder, the main valve having a port in registration with the branch passage being used for the return flow of fluid, and an outlet pipe in communication with the interior of the main valve to receive the fluid therefrom.

6. In a device of the type described: a valve casing having a fluid receiving header at each end; said valve casing having a central compartment with bores placing the ends of the central compartment in communication with the end headers; an elongated hollow valve body having hollow cylindrical end portions slidably received in and completely filling the bores; the headers having reduced cylindrical portions of the same size as the bores and adapted to slidably receive the cylindrical end portions of the valve body; the reduced cylindrical portions of the headers having fluid inlet ports communicating therewith that are closed when the valve body cylindrical end portions are received in the reduced cylindrical portions of the headers; the hollow cylindrical end portions of the valve body having inlet openings in the cylindrical surfaces thereof that are closed when these surfaces are received in the bores of the valve casing; a conduit communicating with each header; an outlet pipe in communication with the central compartment of the valve casing; the hollow valve body having outlet openings placing the interior of the body in communication with the central compartment; the valve body when in neutral position permitting fluid to flow from both inlets into the headers and thence into the interior of the hollow valve body and from there through the last named outlet openings in the body, into the central compartment and out through the outlet pipe; the conduits also adapted to have fluid pass therein into; and means for moving the valve body longitudinally in either direction; the valve body when moved in one direction causing the inlet openings in the trailing cylindrical end portion to be closed by the associate bore in the valve casing, and the forward cylindrical end portion to close off the inlet to the header in which it moves; whereby fluid can enter the header associated with the trailing cylindrical end portion of the valve body, and flow into the conduit communicating with that header; and fluid can flow from the other conduit into the associate header and then flow into the forward cylindrical end portion of the hollow valve body and from there into the central compartment of the valve casing and out through the outlet pipe.

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