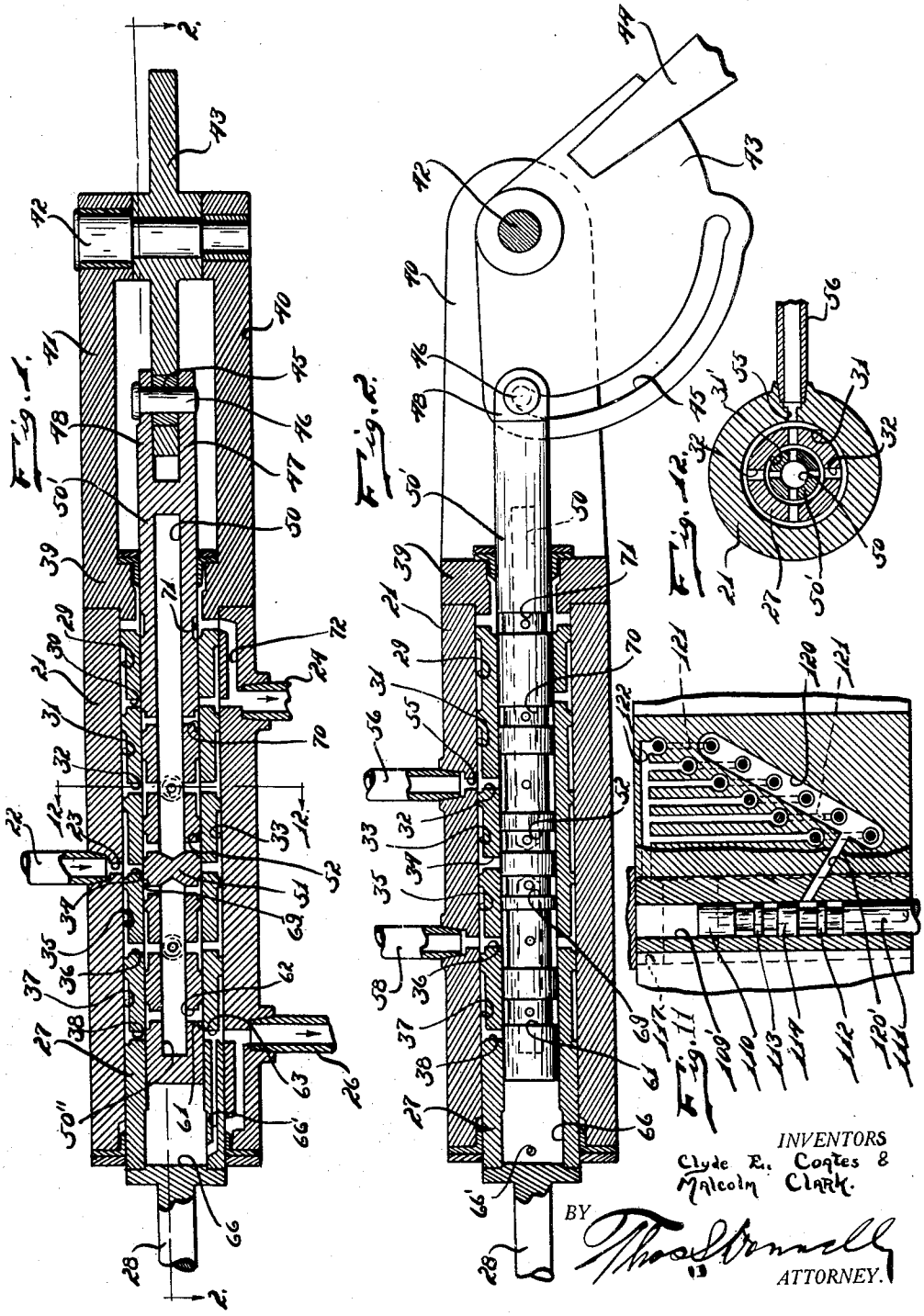
May 8, 1934. C. E. COATES ET AL 1,957,759

HYDRAULIC CONTROL

Filed June 3, 1929 4 Sheets-Sheet 1



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HYDRAULIC CONTROL

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Fig. 9.

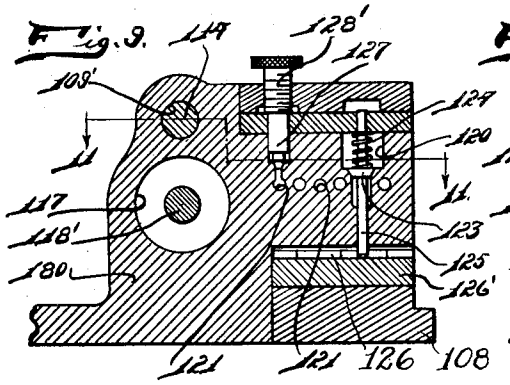


Fig. 10.

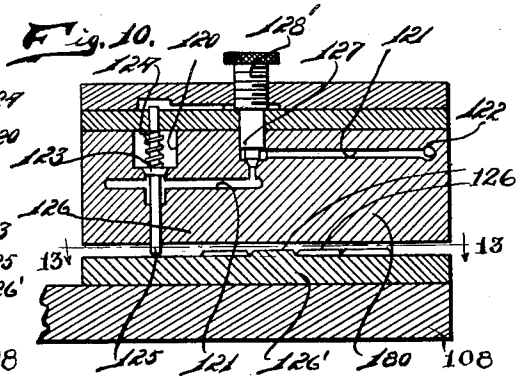


Fig. 3.

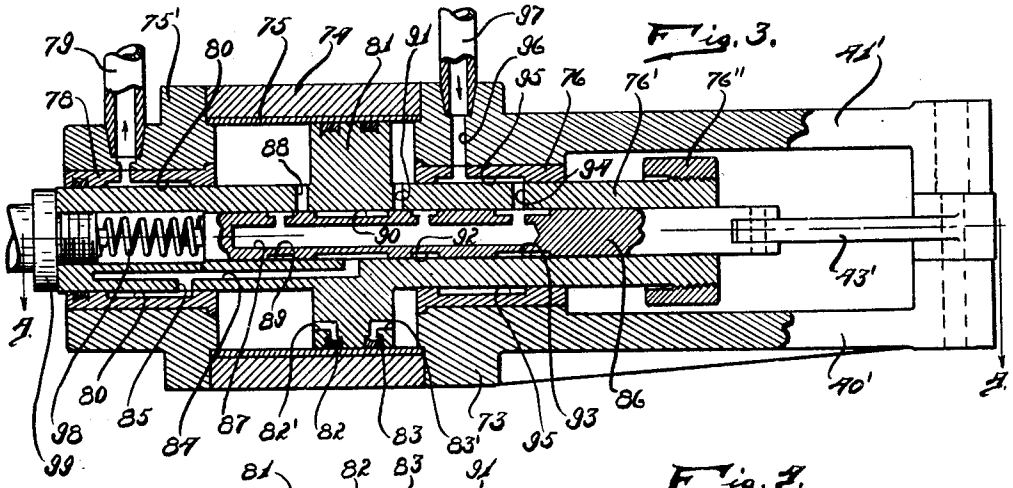


Fig. 4.

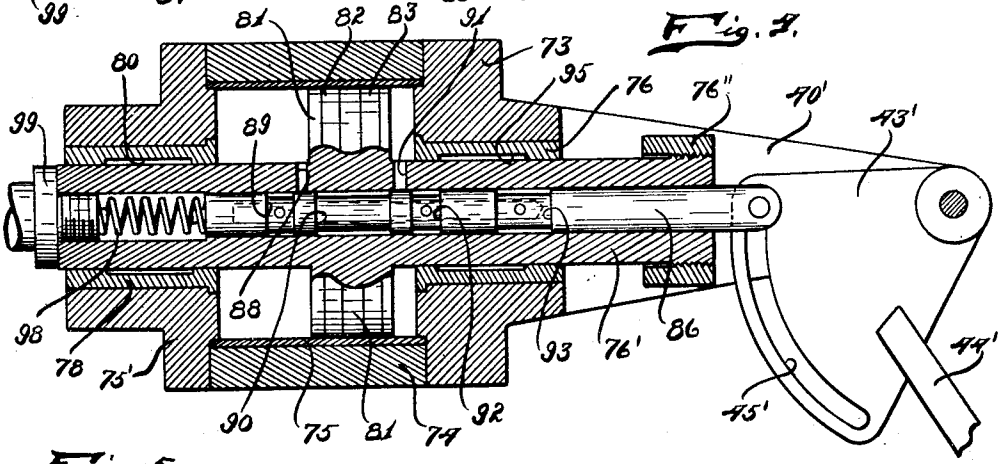
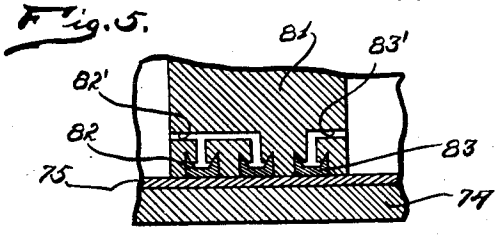


Fig. 5.



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Fig. 7.

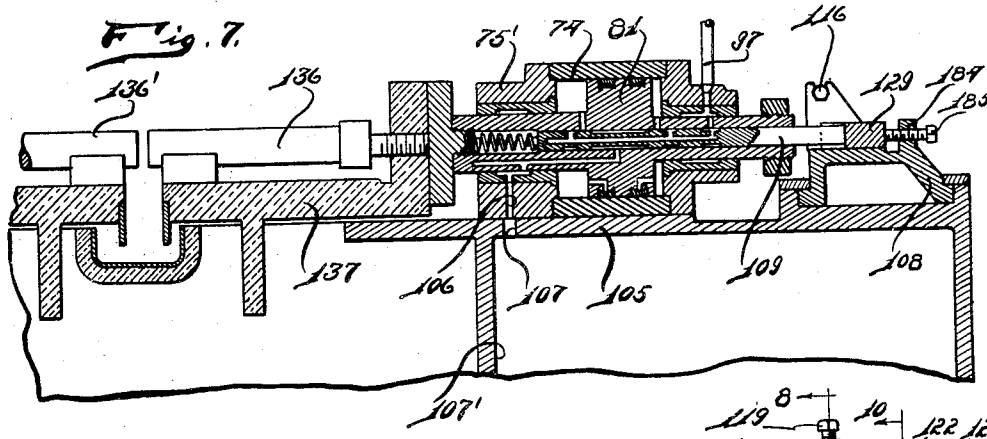


Fig. 6.

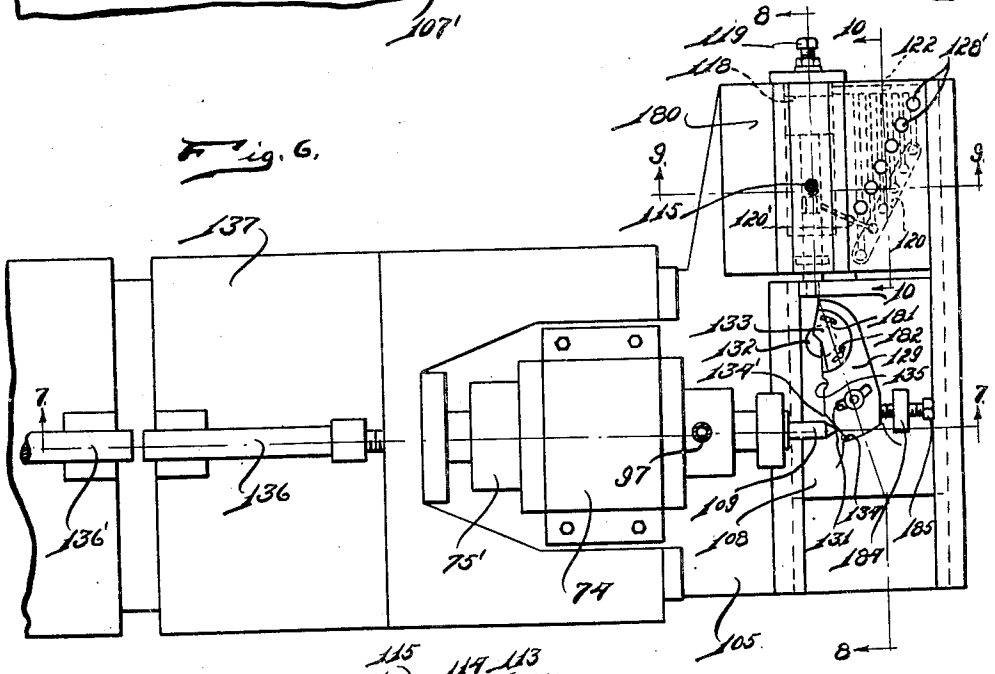
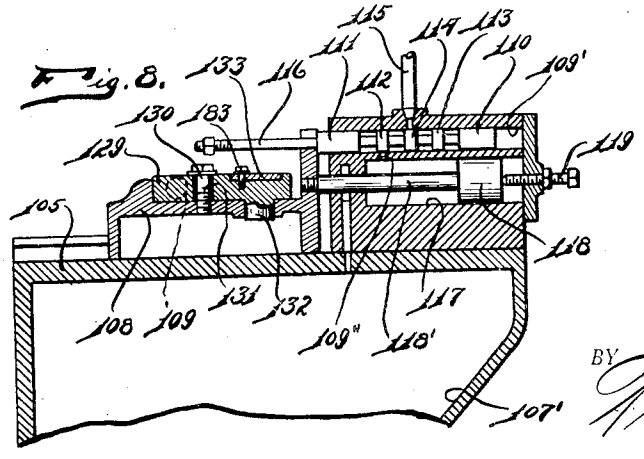


Fig. 8.



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Fig. 14.

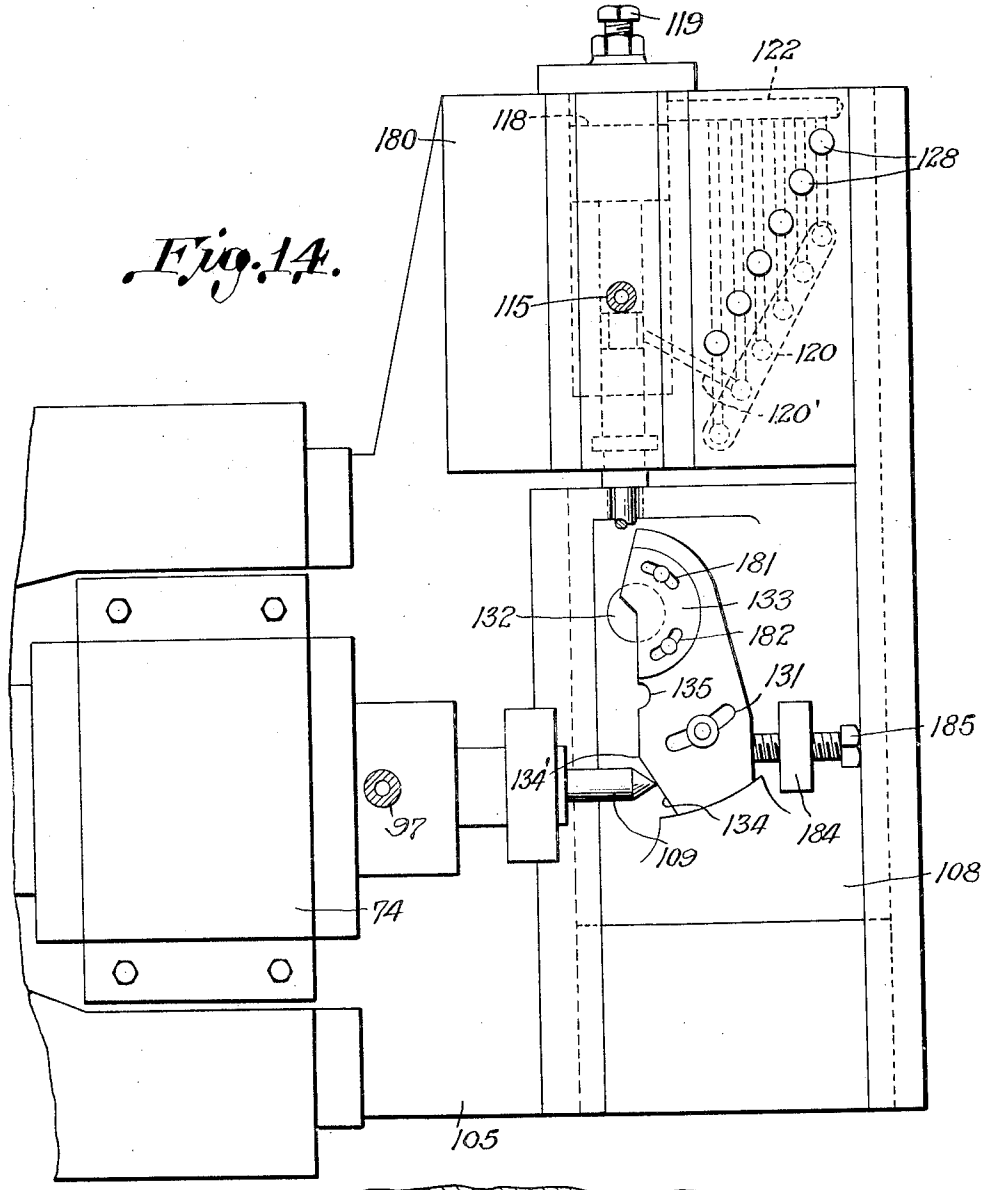
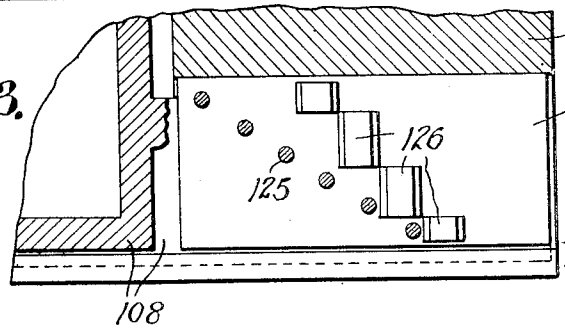


Fig. 13.



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UNITED STATES PATENT OFFICE

1,957,759

HYDRAULIC CONTROL

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Application June 3, 1929, Serial No. 368,156

7 Claims. (Cl. 219—4)

Our invention relates to a new and useful improvement in a hydraulic control adapted for use on butt welding machines and other types of machines in which a hydraulic control is utilized or on which a hydraulic control may be mounted for operation.

It is an object of the present invention to provide a hydraulic control whereby the movements of the ram may be positively and easily and accurately controlled.

Another object of the invention is the provision of a hydraulic control which will so operate as to render the operation of the machine on which mounted more efficient.

Another object of the invention is the provision in a hydraulic control of automatic means for operating the same through the various stages of operation of the machine on which used.

Another object of the invention is the provision of a slide control which will be simple in structure, economical of manufacture and highly efficient in use.

Another object of the invention is the provision of a control of this class which will be compact.

Other objects will appear hereinafter.

The invention consists in the combination and arrangement of parts hereinafter described and claimed.

The invention will be best understood by a reference to the accompanying drawings which form a part of this specification and in which,

Fig. 1 is a longitudinal sectional view through the invention.

Fig. 2 is a view taken on line 2—2 of Fig. 1.

Fig. 3 is a central sectional view through a modified form or adaptation of the invention.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary sectional view illustrating the sealing rims used in the forms shown in Figs. 3 and 4.

Fig. 6 is a top plan view of an automatic form of the invention.

Fig. 7 is a fragmentary sectional view taken on line 7—7 of Fig. 6.

Fig. 8 is a sectional view taken on line 8—8 of Fig. 6.

Fig. 9 is a sectional view taken on line 9—9 of Fig. 6.

Fig. 10 is a sectional view taken on line 10—10 of Fig. 6.

Fig. 11 is a view taken on line 11—11 of Fig. 9.

Fig. 12 is a sectional view taken on line 12—12 of Fig. 1.

Fig. 13 is a fragmentary sectional view taken on line 13—13 of Fig. 10.

Fig. 14 is an enlarged fragmentary top plan view of a portion of the structure illustrated in Fig. 6.

In the form shown in Figs. 1 and 2 we have illustrated a hand control or hand operated form of the invention. In this form we provide a housing 21 leading into which is an oil delivery pipe 22 communicating with the interior of the housing 21 through the pipe 23. Communicating with the interior of the housing 21 at the opposite side thereof are outlet or exhaust pipes 24 and 26 which lead to the oil sump or reservoir from which the oil may be delivered under pressure to the delivery pipe 22. Slidably mounted in the housing 21 is a sleeve 27 secured to which is a connecting rod 28 adapted to be connected to the work piece slide. Formed in the periphery of the sleeve 27 and extending completely around the same is a groove or recess 29 which communicates through the passage 30 with the interior of the sleeve. A similar peripheral groove 31 communicates through the passage 32 and a groove 33 communicates through the passage 36 and the groove 37 communicates through the passage 38. Mounted on the rearward end of the housing 21 is a head 39, projecting rearwardly from which are the spaced bracket arms 40 and 41 between which is pivotally mounted on a pin 42 an operating or cam plate 43 having the operating handle 44 attached thereto. An arcuate slot 45 is formed in the plate 43 and projected through this slot is a pin 46 which is also projected through the arms 47 and 48 which project rearwardly from the valve slide or plunger 50' in which is formed the compartment or chamber 50 which is separated by the partition 51 from the chamber 50''.

In operation, when the pipe 22 is connected to the source of oil supply and it is desired to move the ram, the operation of which is controlled by this control, a rocking of the plate 43 will effect a slidable movement of the slide valve or plunger 50'. In the form shown in Fig. 1, the plunger 50' may be moved to the left so as to bring into registration with the passage 34 the peripheral circumferentially extending groove or recess 52 which communicates with the chamber or compartment 50. At the same time that the groove 52 is brought into registration with the passage 34, the circumferentially extending peripheral groove 61 which communicates with the compartment 50'' through the passage 62 will be brought into registration with

the passage 38 and with the passage 63, thus establishing communication between the compartment 50'' and the exhaust pipe 26. At the same time the pipe 58 will be in communication with the compartment 50'' so that the oil may return from the ram and pass through the pipe 26 while the oil delivered to the compartment 50 will be permitted to proceed to the ram through the passage 55 and the pipe 56.

A reverse movement of the plate 43 will bring the groove 69 into communication with the passage 34 and at the same time communication of the pipe 26 with the compartment or chamber 50'' will be closed and communication between the compartment 50 and the pipe 56 will be closed, opening communication between the compartment 50 and the pipe 24 through the passage 30 and the peripheral groove 70. Formed in the sleeve 27 adjacent its forward end is a chamber 66 from which the oil which may have leaked thereinto may be drained through the passages 63 and 66' and the drain pipe 26. At the same time that the groove 70 registers with the passage 30, the passage 72 will communicate with the peripheral groove 71, the groove 71 being formed as a catch for oil leaking rearwardly around the valve 50'.

With a control of this nature, the movements of the ram may be very delicately controlled and close work may be effected with greater efficiency, while at the same time maintaining the machines operated by the hydraulic control under perfect control so that safety of operation as well as efficiency of work and economy in labor may be effected. As the ram moves, the workpiece slide will draw the sleeve 27 with it so that the registration of the groove 52 or 69 with the opening 34 will no longer be maintained. Thus, the supply of oil will be shut off and further movement of the ram stopped. It is thus apparent that the operator, by movement of the plunger 50', will control the movement of the ram, the ram moving the same distance that the plunger 50' has been moved.

In the form shown in Figs. 3 and 4 we have provided a construction whereby the valve is contained in the ram itself. The plate 43' is provided with the operating handle 44' and the slot 45', this plate 43' being pivotally mounted on the rearwardly extending bracket forming arms 40' and 41' which project outwardly from the head 73. A cylinder 74 is provided with a hardened lining 75 and a head 75' is mounted on the end of the cylinder opposite to the head 73. A sleeve 76' is slidably mounted in bushings 76 and 78, an abutment cap 76'' being mounted on one end of the sleeve 76'. An exhaust pipe 79 which serves to conduct the oil from the cylinder is mounted in the cap 75' and adapted to communicate with an internal circumferentially extending recess 80 formed in the bushing 78. A piston 81 is slidably mounted in the cylinder 74 and is provided with sealing rings 82 and 83, passages 82' and 83' being formed in the piston 81 to permit the pressure of the oil to force the sealing rings 82 and 83 outwardly to close engagement with the inner surface of the lining 75. Formed in the sleeve 76' is a passage-way 84 communicating through the opening 85 with the groove or recess 80. A plunger 86 is slidably mounted in the sleeve 76' and provided with a hollow space or compartment 87 which is adapted to communicate through the passage 88 and the peripheral groove 89 with the cylinder 74 upon movement of the plunger 86 to a position for bringing the circumferentially extending peripheral groove 89 into registration with the passage 88. A peripheral circumferentially extending groove 90 is formed on the plunger 86 and normally in communication with the passage 84 and through this passage 84 with the return or exhaust pipe 79. A passage way 91 is formed in the sleeve 76' to establish communication between the compartment 87 and the cylinder at one side of the piston 81 when the circumferentially extending groove 92 is brought into registration with the passage 91 by movement of the plunger 86 to a predetermined position. A peripheral circumferentially extending groove 93 is formed in the plunger 86 in communication through the passage 94, the passage 95 and the passage 96 to the inlet or delivery pipe 97. A spring 98 is positioned in the sleeve 76' and in engagement with one end of the plunger 86 and a plug 99 mounted in the sleeve 76'.

In operation, when the plunger 86 is manually moved so as to bring the groove 92 in registration with the opening 91, the oil passing through the passages 96, 95, 94, 93, 87, 92 and 91 will engage against the piston 81 and force it to travel in the cylinder 74, the oil at the opposite side of the piston being permitted to escape through the passage 88, the groove 90, the passage 84, the groove 80 and the return or exhaust pipe 79. When the piston 81 moves in the cylinder so as to move the opening 91 out of registration with the groove 92, further movement of the piston will cease so that the operator, by moving the plunger 86 a predetermined distance will determine the distance the piston 81 is to move. When the plunger is moved in the opposite direction so as to bring the groove 89 into registration with the passage 88, the piston 81 will be caused to move in the opposite direction, the passage 91 being brought into registration with the groove 90 and permitting the escape of oil through the passage 84, the opening 85 and the groove 80.

In the remaining figures, we have illustrated an automatic operation of a hydraulic control. As shown in Fig. 7, the invention is illustrated as mounted on a bed 105. The form of control used in this form aside from the automatic feature is as shown in Figs. 3 and 4 excepting that the return pipe 79 is dispensed with and a passage 106 is formed in the head or cap 75' so as to permit the passage of the exhaust or returning oil through the opening 107 so that it may be deposited in the reservoir 107'. Mounted on the bed 105 is a carriage or slide 108 which carries a mechanism for moving the valve or thrust member 109 inwardly to control the operation of the piston 81. Mounted on the bed 105 at one side thereof as shown clearly in Fig. 6 and Fig. 8 is a housing in which is formed a cylinder or compartment 109'. Slidably mounted in this compartment is a piston head 110 mounted on the rod 116 as is likewise the piston head 111. Smaller pistons or collars 112, 113, and 114 are fixedly mounted on the rod 116, the collar or piston 112 controlling communication of the oil delivery pipe 115 with the compartment 109'. This compartment 109' is in communication with the cylinder 117 through a bleed opening 109''. Slidably mounted in the cylinder 117 is a piston 118 having a piston rod 118' connected to the slide 108, a screw 119 adjusting the position of the piston 118 when moved to its rearward position. The chamber 109' communicates by the passage 120'

with a chamber 120 formed in the block in which the chamber 109' and the cylinder 117 are formed, this block being stationary on the bed 105. The chamber 120 communicates by the passages 121 and the passage 122 to the cylinder 117 rearwardly of the piston 118. The communication of each of the passages 121 with the chamber 120 is similarly controlled so that a description of one will suffice for all. A valve 123 is slidably mounted in the block 180, this valve being normally held by the spring 124 in closed position so as to close communication between the chamber 120 and the passage 121. A valve stem 125 projects from the valve 123 and when the slide moves, the valve stem 125 will be brought into engagement with a boss 126 on a slide plate 126', thus moving the valve off of its seat and opening communication between the passage 121 and the chamber 120. Interposed in each of these passages is a needle valve 127 having a threaded adjusting portion 128 to adjust the amount of oil which may be permitted to pass from the passage 121 through the passage 122 into the cylinder 117. Mounted on the slide 108 is a cam plate 129. A bolt 130 is threaded into the slide 108 and projected through a slot 131 in which the bolt 130 has play. A stud 132 is mounted upon and projects downwardly from the plate 129 and projects into an opening formed in the slide 108, this stud 132 forming a pivot for swinging movement of the plate 129 within the range of its movements as determined by the ring or slot 131. Mounted on the upper surface of the plate 129 which is recessed for its reception is a cam plate 133 having slots 181 and 182 formed therein through which project bolts 183 so that the plate 133 may be adjusted to various positions on the plate 129. A lug 184 projects upwardly from the slide and threaded through this lug is an abutment screw 185 to serve as a resistance or locking member for the plate 129. As shown in Fig. 6, the plate 129 is positioned on the slide 108 in such a position that when the slide 108 is moved transversely of its supporting bed or transversely of the axis of the plunger 109, the end of the plunger 109 will be brought into engagement with the face of the plate 129. Both ends of the plate 129 are tapered outwardly to provide at adjacent edges high points 134 and 134' and intermediate the ends of the plate is the recess 135. In Fig. 7 we have illustrated the welding members 136 and 136' operated by the device, these welding members being carried by the work slide 137.

When the hydraulic control is used on a welding machine, there are six principal stages of movement and to this end we have provided six valves 128' and on the cam slide 126' there are as many cams as there are valves. These valves are successively operated by the successive engagement of the cams therewith so that as the cam slide 126' is moved to its various positions the valve stems will be successively engaged and the valves 123 successively operated. In the six stages mentioned, the first movement is a quick approach, the second the position of burning off the surplus metal, the third the position of preheating, the fourth, the back-away movement which also is a left movement, the fifth is the position of flash and the sixth the movement of upset which again should be a quick movement. It is believed that an inspection of the top plan of the cam arrangement will indicate to those skilled in the art that these movements at the various stages are automatically effected. The slide plate 126' is connected to and moves in unison with the slide plate 108. In operation the rod 116 is moved longitudinally manually or in any other desired manner so that the piston or collar 114 will uncover the opening and permit delivery of fluid under pressure from the pipe 115 into the compartment 109'. This fluid may then pass through the passage 120' into the chamber 120 and the end valves 123 will be held open by the cam boss 126 on the slide plate 126'. This will permit entry of fluid through the passage 122 into the cylinder 117 behind the piston 118, thus forcing the piston to move longitudinally in the cylinder and deliver a thrust to the plate 108 transversely of the axis of the thrust member 109. This will cause the inclined surface of the plate 129 to force the member 109 inwardly. This will effect the movement of the first stage which will be a quick approach. As previously mentioned, the various valves 123 will be adjusted to permit the flow of varied volumes of liquid. As the plunger 109 rides over the point 134' on the cam plate 129, the next succeeding pair of valves 123 will be successively opened, and these valves will be adjusted differently than the first valve to admit a different volume of liquid into the cylinder 117, thus regulating the speed of travel of the piston 118. These two valves represent the next stages, namely, the burning off and the preheating. As the succeeding valves are engaged, the travel would continue and when the member 109 would engage in the recess 135, the back away movement would be effected which would last for a short period of time as the movement would still continue and the remaining two valves would be moved to open position. As the plunger 109 is engaged by the point on the plate 133, the movement of upset which is a quick movement would be effected.

The bolt 130 will serve to clamp the plate 129 in its various positions of adjustment, this plate 129 being swung on the stud 132. However, the bolt 185 is utilized to assist in resisting back thrust on the plate 129. It is obvious that the angle of pivot of the plate 129 will effect the operation of the plunger 109 as the plate 108 is slid in response to the movement of the piston 118. In this way, the movement of the plunger 109 for the various stages may be effected. The upset, which is the last movement, may also be determined and regulated by rocking the plate 133 to various positions on its pivot.

With this mechanism, therefore, it is obvious that the operator need only, for a complete cycle of operation, thrust the rod 116 to open position, whereas in the manually operated mechanisms, a variation of the movement will be necessary as the cycle of operation of the wheel is carried on. In order to reverse the operation, that is, to cause the piston 118 to slide in the reverse direction, it would be but necessary to move the rod 116 so that the liquid may flow through the bleed 109'' into the cylinder 117. This would leave the plate 126' in position to retain the end valve 123 open.

While we have illustrated and described the preferred form of our invention, we do not wish to limit ourselves to the precise details of structure shown but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a hydraulic control of the class described:

a slidable work slide; a housing; delivery means communicating with said housing for delivering fluid thereinto under pressure; a slidable control for controlling communication of said delivery means with said housing; means for moving said control to open position, said control being movable to various degrees of open position; and means operable upon the sliding of said work slide a predetermined distance for moving said valve to closed position, said distance of movement of said work slide necessary for effecting a movement of said valve to closed position being dependent upon and determined by the distance of initial movement given to said valve for moving the same to open position.

2. In a hydraulic control of the class described a slidable work slide; a fluid delivery means; control means for controlling the flow of fluid through said delivery means; automatically operated means for moving said control means to various positions; means for moving said control means to closed position upon release of the moving force of said automatic means on said control means; and means for moving said control means to closed position upon the slidable movement of said work slide a predetermined distance.

3. In a device of the class described: a slidable work slide; fluid delivery means; movable control means for controlling the flow of fluid through said delivery means, said control means being movable to various open positions; automatic means for moving said control means to open position; means for operating said automatic means; a plurality of valves for controlling the operation of said automatic operating means; and means for moving said control means to closed position upon the slidable movement of said work slide a predetermined distance, said distance being determined by and dependent upon the position of initial movement of said control means.

4. In combination with a work slide slidable by a hydraulic mechanism, a hydraulic control for said mechanism comprising: a housing; means for delivering liquid under pressure to said housing; a movable valve for controlling communication of said delivery means with said housing; means for moving said valve to open position; and means connecting to said work slide adapted upon movement of said work slide for moving said valve to closed position, said movement of said valve to closed position beginning with the incipient movement of said work slide.

5. In combination with a work slide slidable by a hydraulic mechanism, a movable control valve movable upon movement to open and closed position in the same direction as said work slide; means for moving said valve to open position; and means connecting said valve to said work slide for effecting the movement of said valve to closed position said movement being effected during the sliding of said work slide and beginning with the incipient movement of said work slide.

6. In combination with a welding mechanism having a slidable work slide slidable by means of a hydraulic mechanism, a control valve for controlling the operation of said mechanism; means for moving said control valve to open position; and means operable immediately upon the movement of said work slide in response to the opening of said valve for moving said valve to closed position.

7. In a welding mechanism having a slidable work slide slidable by means of a hydraulic mechanism: a control valve for controlling the operation of said mechanism; means for moving said valve to various degrees of open position; and means operable upon the sliding of said slide in response to the opening of said valve and during the slidable movement of said slide for moving said valve to closed position, the duration of the movement of said valve to closed position being dependent upon the degree to which said valve may be moved to open position.

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