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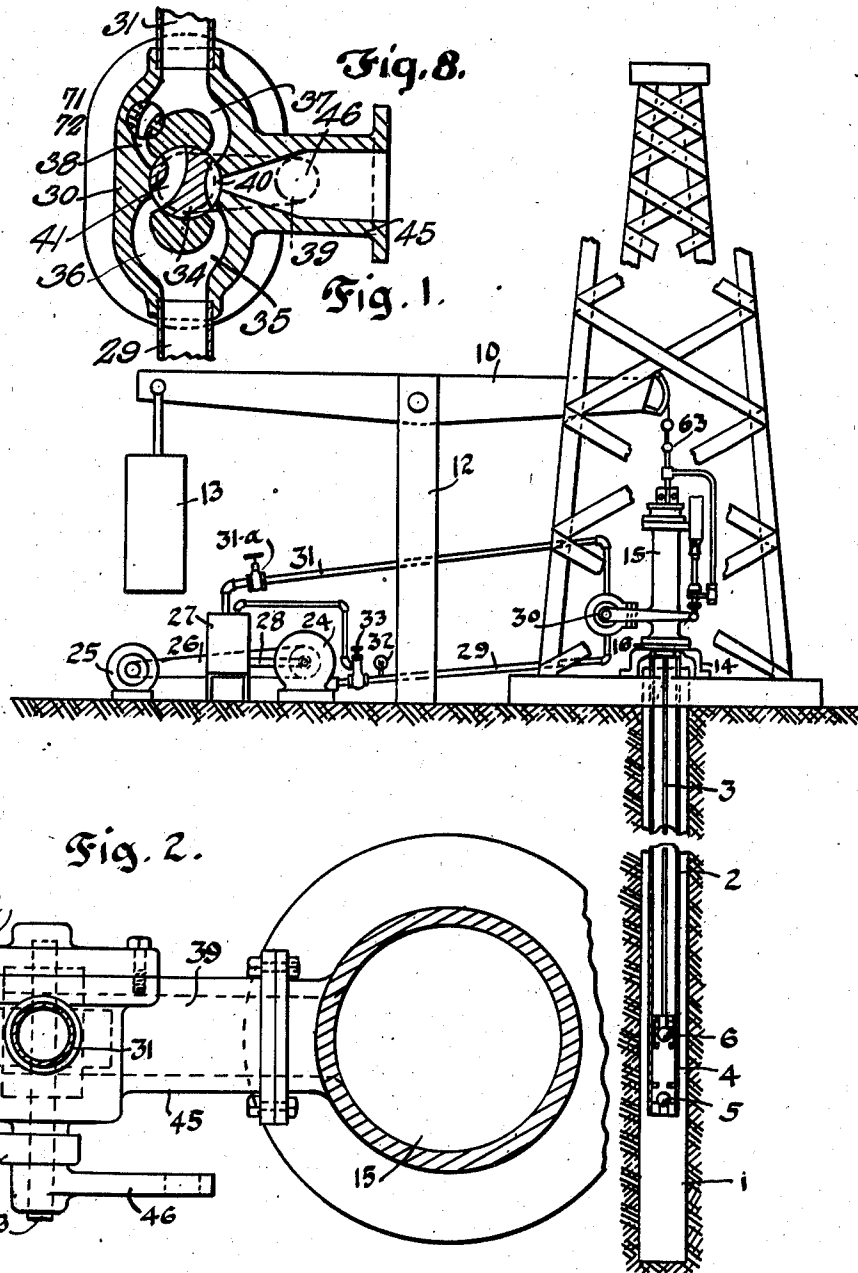
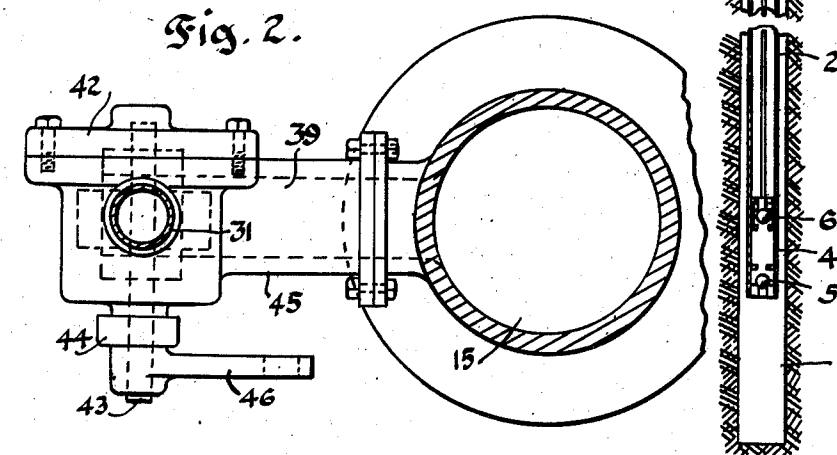
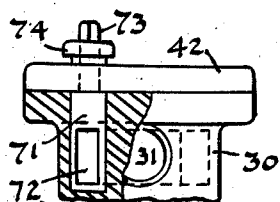
H. M. SALENTINE

2,073,809

MOTOR FOR OIL WELL PUMPING SYSTEM

Filed April 18, 1932

3 Sheets-Sheet 1



INVENTOR.

Herbert M. Salentine

BY

F. K. Carwell

ATTORNEY.

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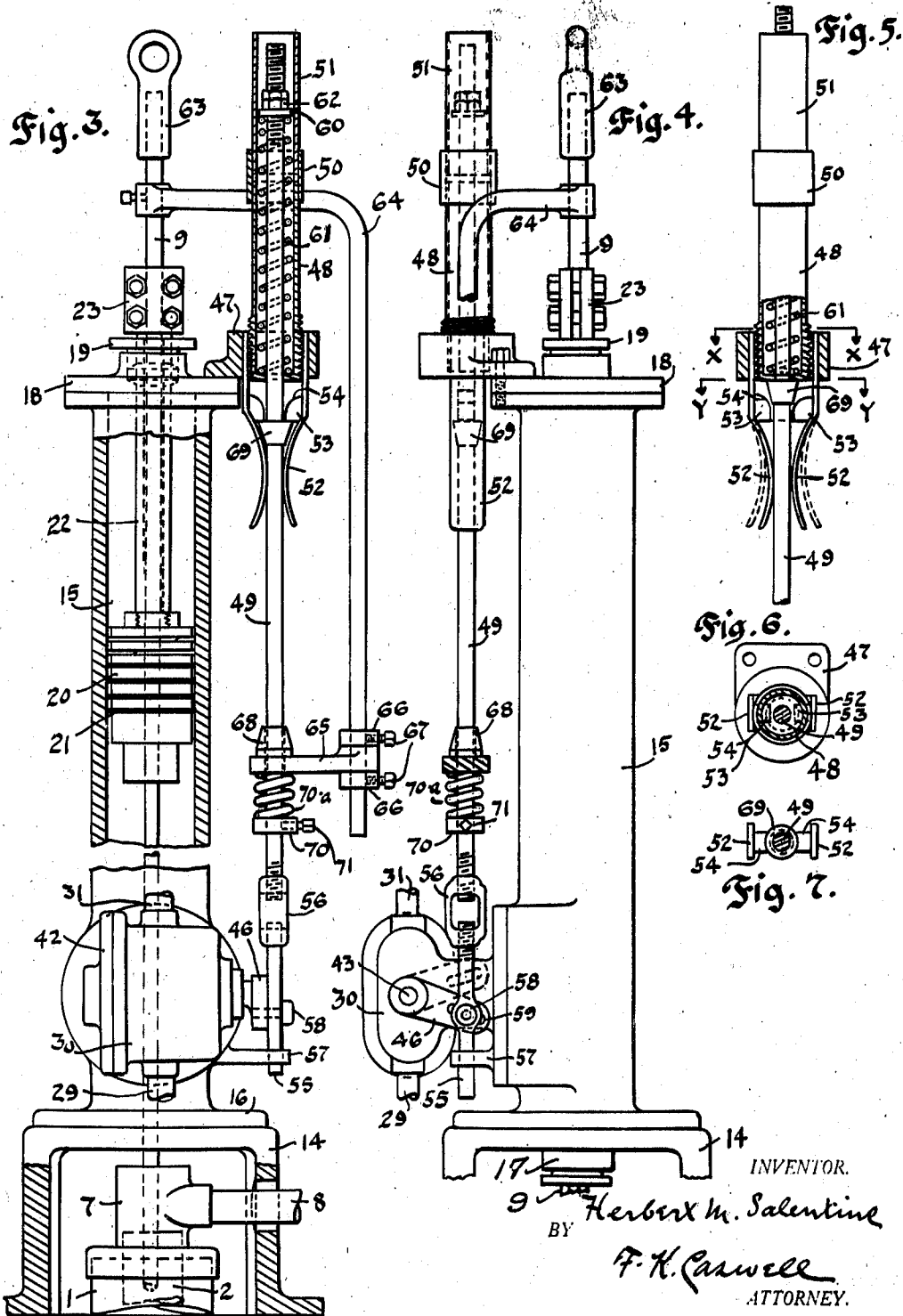
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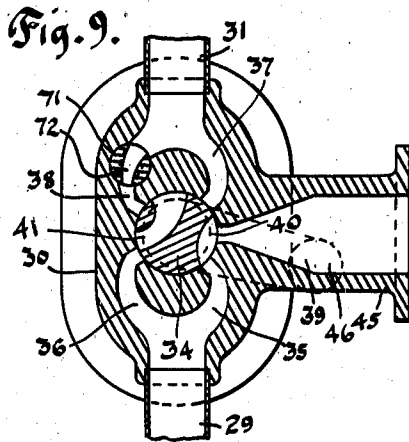
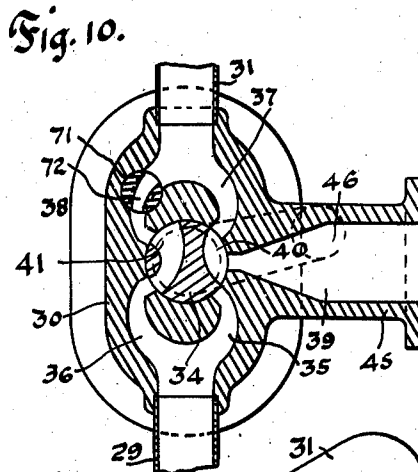
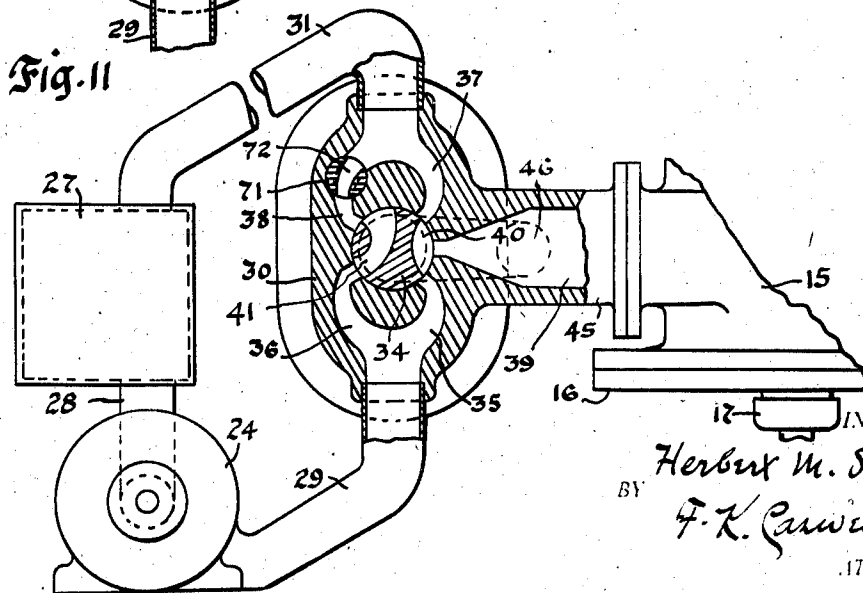
H. M. SALENTINE

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INVENTOR.
Herbert M. Salentine
BY F. K. Carville
ATTORNEY.

UNITED STATES PATENT OFFICE

2,073,809

MOTOR FOR OIL WELL PUMPING SYSTEM

Herbert M. Salentine, Los Angeles, Calif.

Application April 18, 1932, Serial No. 605,916

12 Claims. (Cl. 121-164)

The usual practice in pumping oil wells is to locate a pump at a suitable depth in the well, the same being operated by a string of sucker-rods, these sucker-rods being given a reciprocating motion by means of a walking-beam which in turn is operated by a source of power such as a bull-wheel with crank and connecting rod, the said bull-wheel being driven by mechanical or electrical power. In this type of pumping system the sucker-rods and pump plunger are operated with relatively equal speed of the walking-beam on both the up and down stroke. In order to obtain a capacity delivery of oil from the pump in wells having a relatively small flow it is customary to operate the pump at comparatively high speed.

Operating the pumping stroke at high speed is objectional as it liberates gases from the oil, resulting in increased viscosity and causing increased frictional resistance and surface tension of the oil, the latter condition causing sand to be carried in the oil.

The purpose of my invention is to provide a method and a means whereby the above disadvantages and other objectional conditions can be overcome by producing a more continuous flow of the oil through the standing valve of the oil well pump, and by more nearly synchronizing such flow with the natural rate of flow of oil from the formation. By changing the ratio of time of the up stroke or pumping stroke from the down stroke of the pump I cause a proportionately greater time of flow of oil or fluid through the standing valve.

The purposes of my invention and the objects to be attained will be more fully understood from the following explanation.

All oils in their natural state bear more or less gas in occlusion and gas in solution. It is very desirable that these gases be retained in the oil until it reaches the surface, as these gases not only reduce the viscosity of the oil and therefore the frictional resistance but also lower the surface tension of the oil and consequently carry less sand to the surface. Any gases liberated only serve to gas-bind the pumping mechanism. In retaining these gases in solution and occlusion a proper fluid column head must be maintained against the oil in the formation. The head must not be too high lest it cause back pressure and retard migration; also it must not be too low or the gases will be liberated from the oil in the formation. To properly operate a pumping mechanism to accomplish the results desired, the most efficient fluid level which will effect the

maximum rate of drainage from the formation must be established. To establish and maintain this efficient fluid level the rate of flow through the standing valve should equal the maximum drainage rate from the formation. The amount of gas in solution varies as the pressure and the volume occupied by occluded gas varies inversely as the pressure. Having a pump barrel submerged in this column of oil, in order to fill this barrel there must be a pressure differential between the inside and outside of the barrel sufficient to overcome the resistance offered by the standing valve. This pressure differential will vary as the rate of the plunger displacement in the barrel, and the lowered pressure within the barrel draws gas out of solution in the oil and will expand the occluded gases, so that in order to maintain the full volumetric efficiency in the pump barrel this expansion must be minimized. Then in order to accomplish the most efficient results the total plunger displacement must equal the maximum flow of oil from the formation, also retaining the proper fluid column head. The rate of plunger movement must accommodate the maximum rate of flow from the formation and be of such speed that any additional pressure differential above that necessary to overcome the resistance of the standing valve will be at a minimum. These conditions will avoid liberation of gas in the barrel and will create more nearly full volumetric efficiency of the pump.

From the foregoing it will be seen that if one up stroke and one down or return stroke is considered as one pumping cycle, then the efficiency of the pumping mechanism increases as the up or pumping stroke time is increased and the return stroke time is accelerated. My invention provides a method and a means whereby these stroke speeds can be varied to any desired ratio, the pumping stroke being regulated to closely synchronize its speed with the rate of migration of the oil in the formation, and the return stroke correspondingly accelerated to compensate for the slow pumping stroke, thus keeping the time of the entire pumping cycle the same. In this way I attain the results hereinbefore shown to be desirable, and at the same time maintain or increase the production of the well, and cause a very decided saving in operating costs.

In order to set the speed of the pumping stroke at its optimum for any given well, I am guided by the following visual indications. I gradually increase the speed at which the plunger rises until the fluid stream delivered begins to be broken by slugs of gas, thereafter slightly retard-

ing it until this condition just ceases. At optimum speed the delivery of fluid from the pump should substantially synchronize with the pumping stroke and should be substantially unbroken by slugs of gas. A smoothly frothy consistency should not be confused with the gas slugs referred to, as this may be due to gas retained in the oil under high pressure in the formation and liberated as the oil approaches atmospheric pressure in rising in the tubing.

I accomplish these objects by the mechanism shown in the accompanying drawings, but other means may be used without departing from the spirit of my invention. Similar numbers refer to similar parts in the several views.

Figure 1 is a view showing the general arrangement of my device as applied to an oil well, showing the underground portion in section. Figure 2 is a horizontal plan view of the control valve with the cylinder in section. Figure 2-a is a detail view of the valve partly in section showing the differential control valve. Figure 3 is a front elevation of the mechanism of my device, partly in section. Figure 4 is a side elevation of the mechanism. Figure 5 is a detail view, partly in section, showing the reversing mechanism in position for the down stroke with the spring action shown in dotted lines. Figure 6 is a horizontal section taken on the line X-X of Figure 5. Figure 7 is a horizontal section taken on the line Y-Y of Figure 5. Figure 8 is an enlarged sectional view of the control valve shown in position to produce a slow downward stroke of the piston. Figure 9 is an enlarged sectional view of the control valve shown in position to produce a fast upward stroke of the piston. Figure 10 is an enlarged sectional view of the control valve shown in position to produce a fast downward stroke of the piston. Figure 11 is an enlarged sectional view of the control valve shown in position to produce a slow upward stroke of the piston. This view also shows diagrammatically the connections to the control valve, including the cylinder, rotary pump, tank and pipes.

The mechanism as shown in the drawings is as follows: The oil well as illustrated in Figure 1 consists of the usual casing 1, with the tubing 2, and sucker-rods 3. Located at any desired point suitable to the conditions of the individual well is an oil pump of the usual construction with a barrel and plunger 4, standing valve 5 and traveling valve 6, and actuated by the sucker-rods 3. At the surface of the well the tubing is provided with the usual means for disposing of the oil as pumped, such as the T 7 and discharge pipe 8, as shown in Figure 3. Connected with the upper end of the sucker-rods 3 is the polish rod 9, which is connected to one end of the walking beam 10, in accordance with the usual practice. The said walking beam is trunnioned on the samson post 12 and carries at its opposite end a counterweight 13. This counterweight is preferably of sufficient weight to partially balance the weight of the sucker-rods 3, but is less than the total weight of the sucker-rods so that there is sufficient unbalanced weight in the sucker-rods to insure a quick downward or return stroke by gravity.

Located on a supporting frame 14 is a hydraulic cylinder 15, provided with a lower cylinder head 16 and a stuffing-box 17 (see Fig. 4) through which the polish rod 9 moves. The upper end of the hydraulic cylinder 15 is partially closed by a cylinder head 18 carrying a rod guide member

19. In the hydraulic cylinder 15 is a piston 20, provided with the usual packing rings 21. Attached to the upper end of the piston 20 is a sleeve 22 and both the piston and the sleeve are adapted to nonleakably encircle the polish rod 9, and the upper end of the sleeve 22, after passing through the guide member 19, is secured to the polish rod 9 by means of the clamp 23. The purpose of this sleeve 22 and the clamp 23 is to provide a means for spacing the pump in the well.

For the operation of the piston 20 in the cylinder 15 any source of hydraulic power may be utilized, but satisfactory results have been obtained by the apparatus shown in Figure 1, in which 24 is a rotary pump driven by any convenient means such as the electric motor 25 and the belt 26. A tank 27 is provided with a suction line 28 connecting the said tank with the intake of the pump 24. The discharge 29 from the pump 25 constitutes a supply line or pipe to one side of a control valve 30; and a return pipe 31 connects the discharge side of the control valve 30 with the tank 27. A pressure gauge 32 can be connected to the supply pipe 29. In case it is desired to prevent excess pressure on the supply pipe 29, a pressure relief valve 33 can be inserted in the said pipe with a by-pass pipe to the tank 27.

The discharge pipe 31 is so designed as to have a volumetric capacity less than that of the hydraulic cylinder 15 and proportioned to provide a cushion for the piston 20 on the lower end of the downward or return stroke, the amount of such cushion being controlled by the valve 31-a. The pipe 31 is downwardly inclined towards the tank 27 to provide gravity drainage.

A preferred type of control valve is shown in Figures 2, 2-a and 8 to 11 inclusive. This type of valve consists of a body 30, a central chamber adapted to contain a plug type of double-ported valve 34; two supply ports 35 and 36 connecting the said chamber to the supply pipe 29; two exhaust ports 37 and 38 connecting the said chamber to the exhaust pipe 31; and a port 39 connecting the said chamber with the interior of the hydraulic cylinder 15. The valve 34 is provided with a port 40 which is adapted to alternately connect the cylinder port 39 with either the port 35 or with the exhaust port 37. The valve 34 is also provided with another port 41 which is adapted to connect the supply port 36 with the exhaust port 38 to form a by-pass to the tank 27 in certain positions of the valve 34. The valve 34 is held in position by the cover plate 42 and has a stem 43 extending through the stuffing-box 44. The entire valve group is connected to and supported by the flanged extension 45 which is bolted to a similar bracket on the cylinder 15. The valve 34 is operated by a trip mechanism acting on the valve by means of a slotted lever arm 46, which is secured to the stem 43. The operation of this valve will be more fully hereinafter described.

The control valve operating mechanism is constructed as follows: Secured to the upper end of the hydraulic cylinder 15 or to its cover 18 is a bracket 47, which is bored and tapped to receive the threaded lower end of a tube 48, the lower end of the said tube being closed with the exception of a hole of sufficient size to pass the valve trip rod 49. The upper end of the tube 48 has secured thereto a sleeve 50 adapted to receive a similar tube 51, which serves as an extension and which can be readily lifted off from the tube 48. The tapped hole in the bracket 47 is slotted on two sides to permit the insertion of two springs 75

52. These springs are secured to the slots in the bracket 47 and extend downwardly and are curved as shown in the several views. Integral with or secured to each of the said springs 52 and on the straight portion thereof is a latch lug 53, having its lower surface flat or at right angles to the said trip rod and having its upper surface 54 curved downwardly toward the said trip rod. The trip rod is in two parts; an upper part 49 and a lower part 55, the two being adjustably connected together by the turnbuckle 56. The lower part 55 is held in alignment by working through the lug 57 and is provided with a pin 58 adapted to engage the slot 59 in the valve lever arm 46. 15 The upper part of the trip rod 49 extends upwardly passing between the springs 52 and the latch lugs 53, thence up through the closed end of the tube 48 and ending with a washer 60 adapted to bear on a compression spring 61 which surrounds the said rod within the tube 48. The compression of the spring 61 is regulated by the nuts 20 62 which are threaded on the said rod.

Adjustably secured to the polish rod 9 between the clamp 23 and the walking beam connection 25 63, and extending laterally and thence downwardly, with its center line parallel to both the cylinder 15 and the trip rod 49 is a reverse rod 64. Adjustably secured to the reverse rod 64 is an arm 65, the said arm being located and held 30 in position on the said rod by means of the collars 66 and the set screws 67. The other end of the arm 65 is bored to enable it to move longitudinally on the trip rod 49. Also slidably mounted on the said trip rod 49 is a trip button 68 which is secured to the arm 65 and is tapered or cone-shaped on its upper end for the purpose of engaging and spreading the curved springs 52 when 35 lifted to a position of contact by the action of the reverse rod 64. Secured to the trip rod 49 is a button 69, shaped in the form of a frustum of an inverted cone, with its upper surface adapted to bear against the lower side of the latch lugs 53 until released by the spreading of the springs 52 and the lugs 53. Adjustably mounted on the 40 trip rod 49 is a reversing collar 70, the same being secured to the trip rod 49 by a set screw or by any other convenient means. Also mounted on the trip rod 49 and located between the arm 65 and the collar 70 is a compression spring 70-a which 45 serves as a cushion when actuated by the arm 65, and also insures the full movement of the valve 34.

The operation of my device is as follows: Assuming that the traveling valve 6 and the piston 20 are in their lowest positions and the control valve 30 and trip rod 49 in the positions 55 shown in Figures 3, 4 and 9, fluid from the rotary pump 24 flows through the pipe 29 to the control valve 30 through the ports 35, 40 and 39 into the hydraulic cylinder 15 and under the piston 20. 60 As the piston rises it lifts the polish rod 9 by means of the sleeve 22 and the clamp 23, and as the sucker-rods 3 are connected to the polish rod 9 and therefore to the pump in the well, fluid is lifted by the traveling valve upwardly through the tubing 2 and out through the delivery pipe 8. 65 At the same time the standing valve 5 opens to refill the pump barrel with oil to be passed through the traveling valve on the return stroke.

As the polish rod rises it carries with it the 70 reverse rod 64 and the arm 65 together with the button 68. When the button reaches the springs 52 it spreads them apart and as they spread the lugs 54 also spread apart releasing the fixed button 69 which is lifted by the spring 61 to the 75 position shown in Figure 5. The button 69 being

fixed on the trip rod 49 the said trip rod also moves upwardly, acting on the control valve lever 46 and reversing the valve 34 to the position shown in Figure 10. In this position the port 39 is connected to the exhaust port 37 by means of the valve port 40 and the weight of the string of sucker-rods 3 causes the polish rod 9 to move downwardly, carrying with it the clamp 23, the sleeve 22 and the piston 20, thus forcing the hydraulic fluid out of the cylinder 15 and through the control valve 34 back to the supply tank 27. 10

As the polish rod 9 is drawn downwardly it carries with it the reverse rod 64, the arm 65 and the button 68, the arm and the button sliding on the trip rod 49 and as the arm 65 descends it 15 finally strikes the spring 70-a and through it carries the collar 70 with it, pulling the trip rod 49 and the button 69 downwardly, spreading the springs 52 by the wedge action of the button 69 on the lugs 54, the said springs and lugs snapping to their closed position as shown in Figure 3. 20 At the same time the trip rod by its downward movement has acted on the control valve lever 46, reversing the control valve 34 back to the position shown in Figure 9, thus completing the cycle of 25 operations.

The foregoing cycle of operation with the control valve 34 in the positions as shown in Figures 9 and 10 would result in maximum speed in either 30 direction of the piston movement; but as the object of my invention is to provide a means whereby the flow of fluid from the well may be made as nearly constant as possible, means must therefore be provided whereby the upward or 35 pumping stroke may be so regulated as to utilize a maximum percentage of the time of the complete cycle and the downward or non-pumping stroke be accomplished in a minimum percentage of such cycle. The greater the percentage of 40 the cyclic time that is utilized on the upward stroke, the greater the percentage of efficiency of the entire pumping system.

There are several adjustments provided which are of vital importance in regulating the operation of my device to suit varying conditions. The 45 point of reversal of the control valve is determined by the setting of the reversing collar 70 on the trip rod 49. The position of the traveling valve 6 in relation to the standing valve 5, that is the space between them, is adjustable by means 50 of varying the location of the clamp 23 on the polish rod 9. The regulation of the speed on the down stroke is accomplished by changing the travel of the button 69 and thereby the movement of the trip rod 49, which in turn determines the angular upward movement of the arm 46 and 55 increases or decreases the rotation of the valve 34 and increases or decreases the opening of the ports 37. Screwing the tube 48 downwardly in the bracket 47 decreases the travel of the button 69 and causes the valve 34 to only partially open 60 the port 37. This results in a slowing up of the down stroke. To increase the speed of the down stroke, the tube 48 is unscrewed to a point where the travel of the button 69 is increased sufficiently to open more fully or completely the port 37, as 65 shown in Figure 10.

The regulation of the speed of the up stroke is accomplished by means of the turnbuckle 56 by 70 which the position of the pin 58 may be varied in its relation to the position of collar 70. It will be seen that sufficient lengthening of the distance between the rods 49 and 55 will give the valve 34 its maximum downward throw and as shown in 75 Figure 9, the discharge ports 35 and 39 will be

fully open and the upward stroke will be operated at full speed. If the turnbuckle 56 is so adjusted as to shorten the distance between the trip rods 49 and 55 the valve will be rotated in a lesser degree with the result that the ports 35, 36, 37 and 38 will be only partially opened as shown in Figure 8 and the up stroke will be slower in proportion to the degree of such adjustment.

Built into the body of the control valve 30 as shown in Figure 2—a and located in the discharge port 38 is a valve 71 which is of the stop-cock type with a port 72, the same being manually operated by the squared stem 73 which protrudes through the stuffing-box 74 located on the valve cover 42. This valve is for the purpose of providing a manually operated means for throttling the exhaust actuating fluid and thus slowing down the downward stroke of the piston.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a single acting hydraulic motor adapted to vertically reciprocate a suspended weight, said motor having a cylinder, a piston therein, a piston rod connected with said weight and a reciprocating valve arranged to control the flow of actuating fluid to and from only the lower end of said cylinder; means for actuating said control valve comprising: a trip rod operatively connected to said valve; a spring arranged to constantly urge said trip rod to upward movement, one end of said spring being held in fixed position as regards said cylinder; a reverse rod moving in unison with said piston rod; a stop on said trip rod cooperating with a projection from said reverse rod to move said trip rod downwardly against the urgency of said spring and thereby to actuate said valve to admit said fluid below said piston; a latch arranged to engage said trip rod at the end of said downward movement, and means carried by said projection to release said latch thereby permitting said spring to move said trip rod upwardly and to actuate said valve to release said fluid from below said piston.

2. Structure substantially as and for the purpose set forth in claim 1, including means for adjustably limiting the upstroke of said trip rod and thereby regulating the degree to which the exhaust side of said valve is opened by the upstroke of said trip rod.

3. Structure substantially as and for the purpose set forth in claim 1, including means for adjusting the relative positions of said stop on said trip rod and the connection of said trip rod to said valve and thereby regulating the degree to which the intake side of said valve is opened by the downstroke of said trip rod.

4. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected to an unbalanced load tending to return the motor in the opposite direction; a source of actuating fluid; a reservoir; and a control valve wherein the control valve includes a body defining ports communicating with said motor, reservoir, and actuating fluid source, and a valve element having passages coacting with said ports to connect said actuating fluid source with said motor and effect hydraulic drive operation thereof, or to connect both said actuating fluid source and motor with said reservoir to permit return movement of the motor under urge of said unbalanced load, said valve element being adjustable to throttle the communication of said motor with said reservoir and thereby regulate the

period required to effect return movement thereof; of an actuating mechanism for said control valve comprising: an actuating mechanism responsive to said motor for shifting said control valve as the motor approaches the extremities of its reciprocation; and means interposed between the actuating mechanism and control valve for limiting movement of its valve element to a predetermined throttling position.

5. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected to an unbalanced load tending to return the motor in the opposite direction; a source of actuating fluid; and a reservoir; of a control mechanism for said motor comprising: a control valve including a body defining ports communicating with said motor, reservoir, and actuating fluid source, and a valve element having passages coacting with said ports to connect said actuating fluid source with said motor and effect hydraulic drive operation thereof, or to connect both said actuating fluid source and motor with said reservoir to permit return movement of the motor under urge of said unbalanced load, said valve element being adjustable to throttle the communication of said motor with said reservoir and thereby regulate the period required to effect return movement thereof; an actuating mechanism responsive to said motor for shifting said control valve as the motor approaches the extremities of its reciprocation; and means interposed between the actuating mechanism and control valve for limiting movement of its valve element to a predetermined throttling position.

6. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected with an unbalanced load tending to return the motor in the opposite direction; and an actuating fluid circulating system wherein means is provided for diverting actuating fluid from the circulating system to said motor to cause driving movement thereof, and permitting return of fluid from said motor in response to the urge of said unbalanced load, said means being adjustable to variably throttle and regulate the rate of return flow of the actuating fluid and thereby to control the period required for return movement of the motor under urge of the unbalanced load; of an actuating mechanism responsive to said motor as it approaches the extremities of its movement, and connected with said means to effect diversion or return of the actuating fluid from the circulating system; and an instrumentality interposed between the actuating mechanism and said means for causing movement thereof to a predetermined throttling position.

7. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected with an unbalanced load tending to return the motor in the opposite direction; and an actuating fluid circulating system; of a control apparatus for said motor comprising: means for diverting actuating fluid from the circulating system to said motor to cause driving movement thereof, and permitting return of fluid from said motor in response to the urge of said unbalanced load, said means being adjustable to variably throttle and regulate the rate of return flow of the actuating fluid and thereby to control the period required for return movement of the motor under urge of the unbalanced load; an actuating mechanism responsive to said motor as it approaches the ex-

tremities of its movement, and connected with said means to effect diversion or return of the actuating fluid from the circulating system; and an instrumentality interposed between the actuating mechanism and said means for causing movement thereof to a predetermined throttling position.

8. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected to an unbalanced load tending to return the motor in the opposite direction; a source of actuating fluid; a reservoir; and a control valve wherein the control valve includes a body defining ports communicating with said motor, reservoir, and actuating fluid source, and a valve element having passages coacting with said ports to connect said actuating fluid source with said motor and effect hydraulic drive operation thereof, or to connect both said actuating fluid source and motor with said reservoir to permit return movement of the motor under urge of said unbalanced load, said valve element being adjustable to throttle the communication of said motor with said reservoir and thereby regulate the period required to effect return movement thereof; of an operating mechanism for said valve element including: a trip rod operatively connected with said valve element; a connecting means joined to said motor so as to reciprocate therewith, said connecting means being operatively engageable with said trip rod as the motor approaches the extremities of its movement to shift said trip rod and thereby shift said valve element; and means interposed in said operating mechanism for adjustably limiting the movement of said valve element and thereby control the throttling position thereof.

9. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected to an unbalanced load tending to return the motor in the opposite direction; a source of actuating fluid; and a reservoir; of a control mechanism for said motor comprising: a control valve including a body defining ports communicating with said motor, reservoir, and actuating fluid source, and a valve element having passages coacting with said ports to connect said actuating fluid source with said motor and effect hydraulic drive operation thereof, or to connect both said actuating fluid source and motor with said reservoir to permit return movement of the motor under urge of said unbalanced load, said valve element being adjustable to throttle the communication of said motor with said reservoir and thereby regulate the period required to effect return movement thereof; an operating mechanism for said valve element including a trip rod operatively connected with said valve element; a connecting means joined to said motor so as to reciprocate therewith, said connecting means being operatively engageable with said trip rod as the motor approaches the extremities of its movement to shift said trip rod and thereby shift said valve element; and means interposed in said operating mechanism for adjustably limiting the movement of said valve element and thereby control the throttling position thereof.

10. The combination with a reciprocable mo-

tor adapted to be driven hydraulically in one direction and continuously connected with an unbalanced load tending to return the motor in the opposite direction; and an actuating fluid circulating system wherein valve means is provided for diverting actuating fluid from the circulating system to said motor to cause driving movement thereof, and permitting return of fluid from said motor in response to the urge of said unbalanced load, said means being adjustable to variably throttle and regulate the rate of return flow of the actuating fluid and thereby to control the period required for return movement of the motor under urge of the unbalanced load; of an operating mechanism for said valve means including: a trip rod operatively connected with said valve means; a connecting means joined to said motor so as to reciprocate therewith, said connecting means being operatively engageable with said trip rod as the motor approaches the extremities of its movement to shift said trip rod and thereby shift said valve means; and means interposed in said operating mechanism for adjustably limiting the movement of said valve means and thereby control the throttling position thereof.

11. The combination with a reciprocable motor adapted to be driven hydraulically in one direction and continuously connected with an unbalanced load tending to return the motor in the opposite direction; and an actuating fluid circulating system; of a control apparatus for said motor comprising: means for diverting actuating fluid from the circulating system to said motor to cause driving movement thereof, and permitting return of fluid from said motor in response to the urge of said unbalanced load, said means being adjustable to variably throttle and regulate the rate of return flow of the actuating fluid and thereby to control the period required for return movement of the motor under urge of the unbalanced load; an operating mechanism for said valve means including a trip rod operatively connected with said valve means, and a connecting means joined to said motor so as to reciprocate therewith, said connecting means being operatively engageable with said trip rod as the motor approaches the extremities of its movement to shift said trip rod and thereby shift said valve means; and means interposed in said operating mechanism for adjustably limiting the movement of said valve means and thereby control the throttling position thereof.

12. In a hydraulic pumping jack: a hydraulic motor comprising a cylinder, a piston therein, a connecting sleeve extending from said piston through an end of said cylinder, and a piston rod extending through and secured to said sleeve, said piston rod projecting beyond both ends of said cylinder; a control valve for regulating the ingress and egress of fluid to and from said cylinder; and a trip mechanism for said control valve comprising a reverse rod connected with said piston rod and movable in unison therewith, a trip rod connected with said control valve, and stop means associated with said rods to shift the trip rod in a manner to operate said control valve as the piston approaches the ends of its stroke.

HERBERT M. SALENTINE.