No. 886,145 PATENTED APR. 28, 1908.

W. B. MASON.

ACCUMULATOR CONTROLLER.

APPLICATION FILED OCT. 12, 1905.

2 SHEETS—SHEET 1.

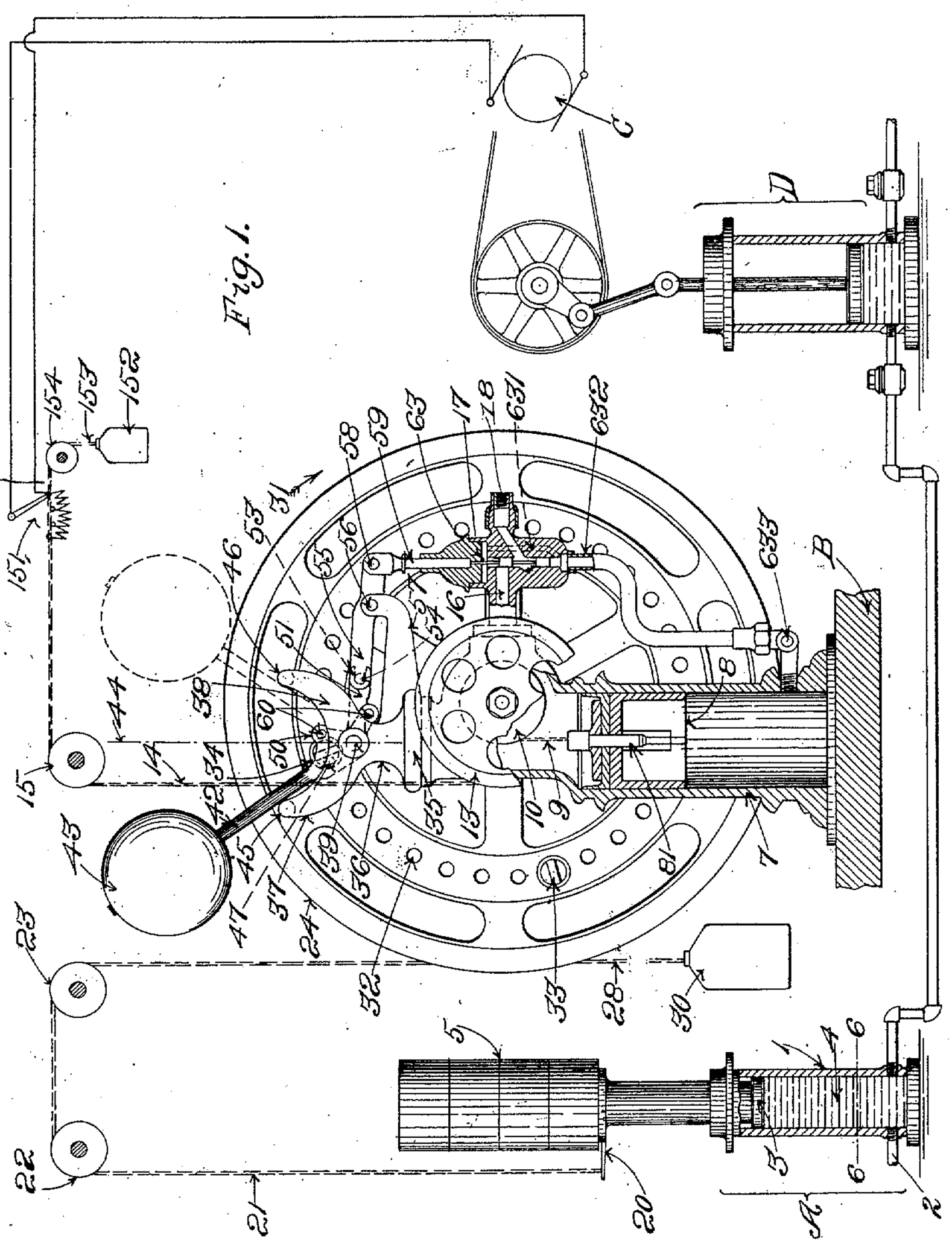

Fig. 1.

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2 SHEETS—SHEET 2.

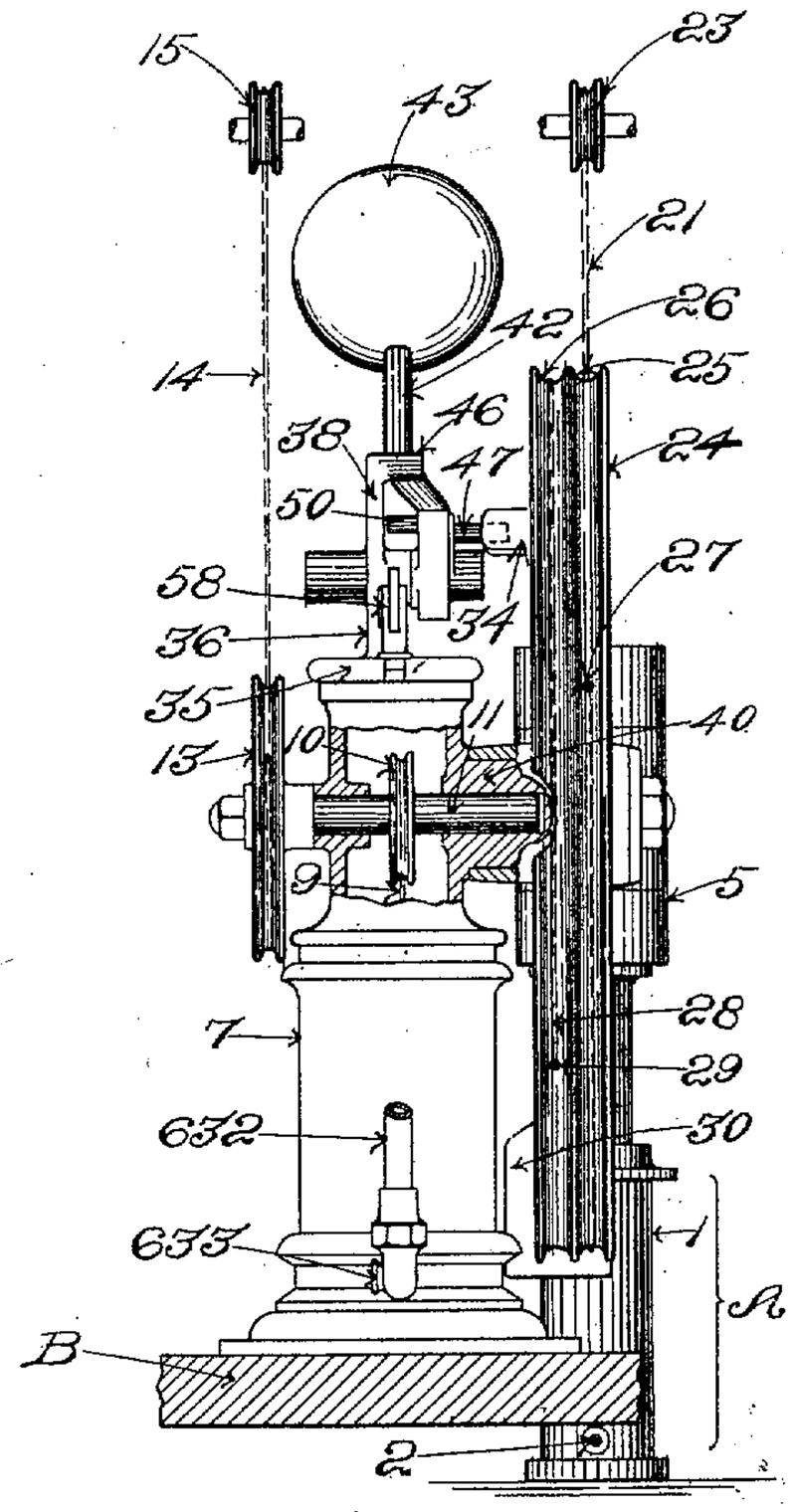

Fig. 2.

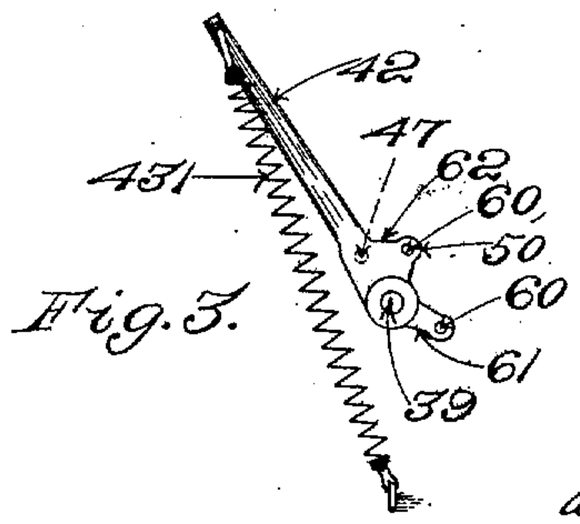

Fig. 3.

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UNITED STATES PATENT OFFICE.

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ACCUMULATOR-CONTROLLER.

No. 886,145. Specification of Letters Patent. Patented April 28, 1908.

Application filed October 12, 1905. Serial No. 282,435.

To all whom it may concern:

Be it known that I, WILLIAM B. MASON, citizen of the United States, residing at Boston, in the county of Suffolk, Commonwealth of Massachusetts, have invented a certain new and useful Improvement in Accumulator-Controllers, of which the following is a specification, reference being had therein to the accompanying drawings.

Accumulators which supply water, air, or other fluid, under pressure to be used for various purposes are well known and in common use. The fluid contained in such accumulators is usually forced into them by a pump and a uniform pressure within the accumulator is maintained regardless of the amount of fluid within the accumulator by means of a piston which bears upon the fluid and the stem of which is weighted to correspond with the pressure desired in the fluid. It is not only desirable that the pump which supplies fluid to the accumulator should be automatically controlled in order to insure a supply of fluid thereto at all times but it is also desirable that the automatic control should be such as to allow the pump to remain at rest during a considerable portion of the time required to empty the accumulator. In other words when the accumulator is full the pump should be cut out, and should remain cut out until the accumulator is nearly empty, when the pump should be again cut in, and permitted to work until the accumulator is again full. It is also desirable that the operation of cutting out the pump or starting it again should be as nearly instantaneous as possible. This is the preferred method of operation.

My invention has for its object to provide an automatic controller for an accumulator pump, which may be used in connection with said pump whether the latter be driven by electricity, steam, or other power, and which shall control the pump in the manner above set forth.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, and the novel features thereof are pointed out and clearly defined in the claims at the close of this specification.

In the drawings,—Figure 1 is a front elevation and Fig. 2 a side elevation of a device embodying my invention. Fig. 3 is a detail of a modification of a device embodying my invention.

That embodiment of my invention which I have illustrated in the accompanying drawings and referred to in the following description has been employed by me in connection with an electrically driven pump and to that end is connected with a rheostat of common construction which I have indicated diagrammatically but do not deem it necessary to describe. As will be clear, however, the device shown may be employed to operate the throttle valve of a steam pump or to operate any similar mechanism by the movement of which the supply of power to the pump is cut off.

For convenience of description, I will employ the term "motive power controller" to designate the rheostat or throttle valve as the case may be.

Referring to the drawings, I have indicated a motor at C which operates the pump D, said pump supplying the fluid under pressure to an accumulator A. The accumulator A comprises a container or cylinder 1, having an outlet as at 2 through which the fluid contents of the cylinder 1 pass to the point at which the fluid is used, and a piston 3 which rests upon the fluid 4 within the cylinder. The piston stem is weighted at 5 to an amount corresponding with the pressure desired on the fluid 4. The fluid 4 is thus maintained under uniform pressure whether the cylinder 1 be wholly or partly filled.

The accumulator A is represented in Fig. 1 as filled, the piston 3 being near the top of the cylinder. At this point in Fig. 1 the pump is cut out, and the piston has ceased to move upwardly, since the pump no longer operates to force fluid into the cylinder. When the fluid under pressure is discharging from the cylinder through the outlet 2, the weighted piston 3 falls. When the piston has traveled downwardly to a predetermined point for example the point marked 6—6, it is desired to again cut in the pump. When this is done, the action of the pump forcing fluid into the cylinder under the piston 3 will cause the piston to rise, and when it has reached its highest position in the cylinder the pump should be again cut out. In this way the pump is at rest during the downward travel of the piston, as will be clear.

To cut the pump out when the piston has

reached the highest point of its travel and cut the pump in again when the piston has reached a predetermined point in its downward travel (which point will be the lowest point in its travel unless the device is reset or adjusted to cut the pump in at a still lower point) I provide the following mechanism. B is a base upon which is mounted a casing or cylinder 7 within which is a piston 8 which is connected by means of a piston rod 81 and a chain 9 with the grooved wheel or pulley 10 which is mounted on a shaft or arbor 11 journaled within the upper portion of the casing 7. The said casing 7 is shaped as shown, see Figs. 1 and 2, to accommodate the said wheel 10. The shaft 11 projects at one end through the casing 7 and is provided outside the casing with a grooved wheel 13, to the periphery of which is attached one end of the chain or flexible connection 14. The chain 14 passes over a properly located idler sheave 15 and thence to the switch or movable arm of the rheostat 151 which I have indicated diagrammatically. By means of chain 14 the said movable arm or switch is moved in one direction and it may be moved in the opposite direction by means of a spring or weight or other well known device when the pull exerted through the said chain has been removed or sufficiently relaxed as will be clear. In the drawings I have shown a weight 152 connected to the arm of the power controller shown as a rheostat 151 by a cord 153 running over a sheave 154. The weight 152 is heavy enough to return the parts to their normal position when the moving force is released.

For the purpose of turning the wheel 13, and thus moving the chain 14 by winding the latter upon said wheel, I actuate the piston 8 within the cylinder 7 by admitting to the space above the said piston water or other fluid under pressure. The supply of water or other fluid under pressure to the cylinder 7 is controlled by a pilot valve 17 of the well known character provided with a movable valve-member 59 adapted to open and close the ports in the said valve 17 at the proper times. Water is admitted through the inlet 18 and port 16. It is exhausted through the said port 16, port 63 and exhaust passage 631 connected with the exhaust pipe 632. The inlet 18 is connected with some suitable source of supply, as, for example, an elevated tank or the water supply pipes of a city or town. In Fig. 1 the valve-member 59 is shown as occupying its lowest position, the port 16 being connected with the port 63 and exhaust passage 631. It will be clear that if the inlet 18 is opened and water under sufficient pressure is admitted through port 16 to the piston 8 the latter will be forced downwardly, causing the wheel 13 and chain 14 to be moved and thereby actuating the switch device to cut in the electrically driven pump. At the proper time, the water is exhausted from the cylinder by the downward movement of the valve member 59 allowing the water to escape through the port 63, and the passage 631 (shown in dotted lines in Fig. 1) to the drip pipe 632 and out the drip 633. It will be seen from the foregoing that the power necessary to move the power controller or rheostat arm 151 and intermediate connections is supplied by the cylinder 7 and piston 8. I have therefore called this group of elements a fluid pressure motor.

For the purpose of opening the valve 17 at the proper time to cut in the pump, that is when the piston 3 of the accumulator is at the lowest point of its travel, I provide the following mechanism. To the piston stem of the accumulator or to the carrier thereon which carries the weight 5, I attach by means of the arm or projection 20, or in any other suitable manner, one end of a chain or flexible connection 21 which is carried upwardly over proper guiding idler sheaves, as 22 and 23, thence to a wheel or tappet-carrier 24 which is provided on its periphery with two grooves 25 and 26. The wheel or tappet-carrier 24 is loosely mounted on a boss or projection 40 extending from the casing 7, see Fig. 2, and may be of any convenient size and shape. Within the said boss 40 is journaled one end of the shaft or arbor 11 and this boss is also utilized as a convenient support for the wheel or tappet-carrier 24, although it is in no way essential to the operation of the device that the wheel or tappet-carrier 24 should be mounted thereon. The chain 21 is received in the groove 25 of the said wheel 24 and the end thereof is secured therein as at 27. By this arrangement the wheel or tappet-carrier 24 is caused to rotate as the piston 3 descends. To cause the wheel or tappet-carrier 24 to rotate in the opposite direction when the piston 3 is rising, a chain 28 is passed around the wheel in the groove 26 and is secured at one end in said groove as at 29. The opposite or free end of said chain or cord 28 is provided with a weight 30. When the wheel or tappet-carrier 24 is freed from the pull of the chain 21 it is caused to rotate in the reverse direction by the weight 30 on the chain 28. The tappet-carrier 24 is rotated in the direction indicated by the arrow 31 (Fig. 1) by the pull of the chain 21 and in the opposite direction by the pull of the chain 28 as above explained. A series of holes 32 is provided in the said wheel or tappet-carrier 24 and two tappets 33 and 34 are provided each of which may be set in any one of the holes 32. By this means the tappets may be positioned relative to each other and to the wheel 24. The tappet-carrier 24 and the tappets 33 and 34 thereon constitute knocking over means which operate the group of elements now to be described, and which for convenience I

denominate a tilt-lever. The knocking over means may be of any convenient form, it only being necessary that it move in consonance with the movements of the accumulator, and cause the tilt-lever to move at the proper times. On the top of the casing 7 I mount a plate 35 which serves as a supporting base for the upwardly projecting portion 36 which is provided with the divergent arms 37 and 38. On the part 36 I pivot at 39 a lever arm 42 which carries a weight 43. The lever 42 may swing from one side to the other of the vertical line 44, its movement in one direction being stopped by contact with a pin or lateral projection 45 from the upper end of the fixed arm 37 and in the other direction by a corresponding pin or projection 46 near the upper end of the arm 38. While I have shown this tilt-lever in Fig. 1 as consisting of a lever arm 42 pivoted at its bottom and carrying a weight at its top, it may be arranged as shown in Fig. 3, where a spring 431 fastened at one end to the upper end of the lever arm 42 and its other end to some point on the machine below the pivot 39 of the lever arm 42 takes the place of the weight 43.

A pin 47 near the lower or pivoted end of the tilt-lever 42 lies in the path of movement of the tappets 33 and 34 on the tappet-carrier 24. As the said wheel or tappet-carrier 24 moves in the direction of the arrow Fig. 1, the tappet 33 will be brought into engagement with the pin 47 on the tilt-lever 42 and the continued movement of the wheel will operate to raise or swing the tilt-lever 42 on its pivot until it is carried slightly past the vertical position indicated by the line 44 when the weight 43 will operate to cause the arm 42 to fall or swing quickly until it rests against the pin 46 at the top of arm 38. Should the tilt-lever 42 stick or work hard on its pivot and so fail to drop when it passes the center line 44 the tappet will by its further movement carry the tilt-lever over and positive action in either direction is therefore assured. The lower end of the tilt-lever 42 is formed into two arms 61 and 62 projecting from which are pins 50 and 60 one above and one below the end of an arm 51 one end of which is pivoted at 39 to the part 36. As the tilt-lever 42 is operated these pins strike and move the lever 51. The other end of said arm 51 is slotted as shown at 53, the said slot engaging a pin 54 fast in the end of the lever 55. The lever 55 is pivoted intermediate its ends at 56 to the end of the fixed arm 57 which extends outwardly laterally from the part 35. The other end of the lever 55 is pivoted at 58 to the upper end of the valve member 59 of the valve 17. By this arrangement when the tilt-lever 42 passes the center and falls quickly into the dotted line position shown in Fig. 1, it imparts a relatively quick movement to the pivoted arm 51 which in turn moves the lever 55, raising the valve stem 59 and at once opening the valve 17. This admits the water pressure to the fluid pressure motor on top of the piston 8 which as previously described operates the chain 14 and the switch device or rheostat connected therewith and cuts in the electrically operated pump. As the accumulator cylinder is filled by the action of the pump, the piston 3 thereon is raised freeing the wheel 24 from the pull of the chain 21 and subjecting it to the pull of the weight 30 acting through chain 28. This causes the wheel 24 to rotate in the opposite direction. The weighted tilt-lever 42 remains, however, in the dotted line position shown Fig. 1, keeping the inlet 18 open, and thus keeping the pump in operation until the tappet 34 has been brought by the reverse movement of wheel 24 into engagement with the pin 47 when the continued movement of the said wheel in the same direction raises the weighted tilt lever 42, swinging it on its pivot until said arm passes the center line 44 when the pin 60 on projection 61 engages the arm 51. The weighted tilt-lever 42 falls quickly into the full line position shown Fig. 1, thereby raising the arm 51, reversing the movement of lever 55 and closing the inlet 18. After the inlet 18 is closed, exhaust port 63 controlled by valve member 59 is opened permitting the water above the piston 8 in the cylinder of the fluid pressure motor to exhaust through the dotted passage 631 into the drip pipe 632, thus releasing the pull of the chain 14 and allowing the weight 152 which reverses the movement of the switch device to operate thus reversing the switch and cutting out the electrically driven pump. This weight 152 also moves the chain 14 in the opposite direction, thereby again raising the piston 8. The pump remains out of operation until the accumulator piston has again descended to the lowest point of its travel when the operation above described is repeated.

By changing the relative positions of the tappets 33 and 34 on the wheel or tappet-carrier 24 any range of movement of the piston in the accumulator cylinder may be secured as will be obvious.

My device as will be clear may be employed wherever it is desired to automatically control a driven part as for example a piston or the like which is actuated from a motor and is to be stopped or started at predetermined points in its travel.

I claim as my invention:

1. In devices for regulating the feed to an accumulator, in combination, the accumulator, a tappet-carrier, connections intermediate the accumulator and the tappet-carrier whereby the said tappet-carrier is operated through variations in the volume of the contents of the accumulator, tappets on the said tappet-carrier, a tilt-lever with which said

tappets engage, and a fluid pressure motor in operative connection with the said tilt-lever.

2. In devices for regulating the feed to an accumulator, in combination, the accumulator, the tappet-carrier, connections intermediate the accumulator and the tappet-carrier whereby the said tappet-carrier is operated through variations in the volume of the contents of the accumulator, tappets on the said tappet-carrier, a tilt-lever with which said tappets engage, a valve in operative connection with said tilt-lever and a fluid pressure motor itself controlled by said valve.

3. In devices for regulating the feed to an accumulator, in combination, the accumulator, a tappet-carrier, connections intermediate the accumulator and the tappet-carrier whereby the said tappet-carrier is operated through variations in the volume of the contents of the accumulator, tappets on the said tappet-carrier, a tilt-lever with which said tappets engage, a motive power controller, a fluid pressure motor operating the motive power controller, and a valve controlling the said motor and in operative connection with the said tilt-lever.

4. In devices for regulating the feed to an accumulator, in combination, the accumulator, a tappet-carrier, tappets thereon, connections intermediate the accumulator and the tappet-carrier whereby the said tappet-carrier is operated through variations in volume of the contents of the accumulator, a motive power controller, a fluid pressure motor actuating the said controller, a valve for said motor, a tilt-lever having projections thereon and being engaged by the said tappets, and a lever in operative connection with the said valve and alternately engaged by the projections on the said tilt-lever.

5. In devices for regulating the feed to an accumulator, in combination, the accumulator, a motive power controller, a tilt lever, a fluid pressure motor set in operation by said tilt lever and operatively connected with the said motive power controller, knocking over means contacting with the said tilt lever and connections intermediate the accumulator and the knocking over means.

In testimony whereof I affix my signature, in presence of two witnesses.

WILLIAM B. MASON.

Witnesses:
WM. A. MACLEOD,
ALICE H. MORRISON.