G. F. STEEDMAN.

AUTOMATIC RETURN FLUID OPERATED DEVICE.

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1,079,613. Patented Nov. 25, 1913.

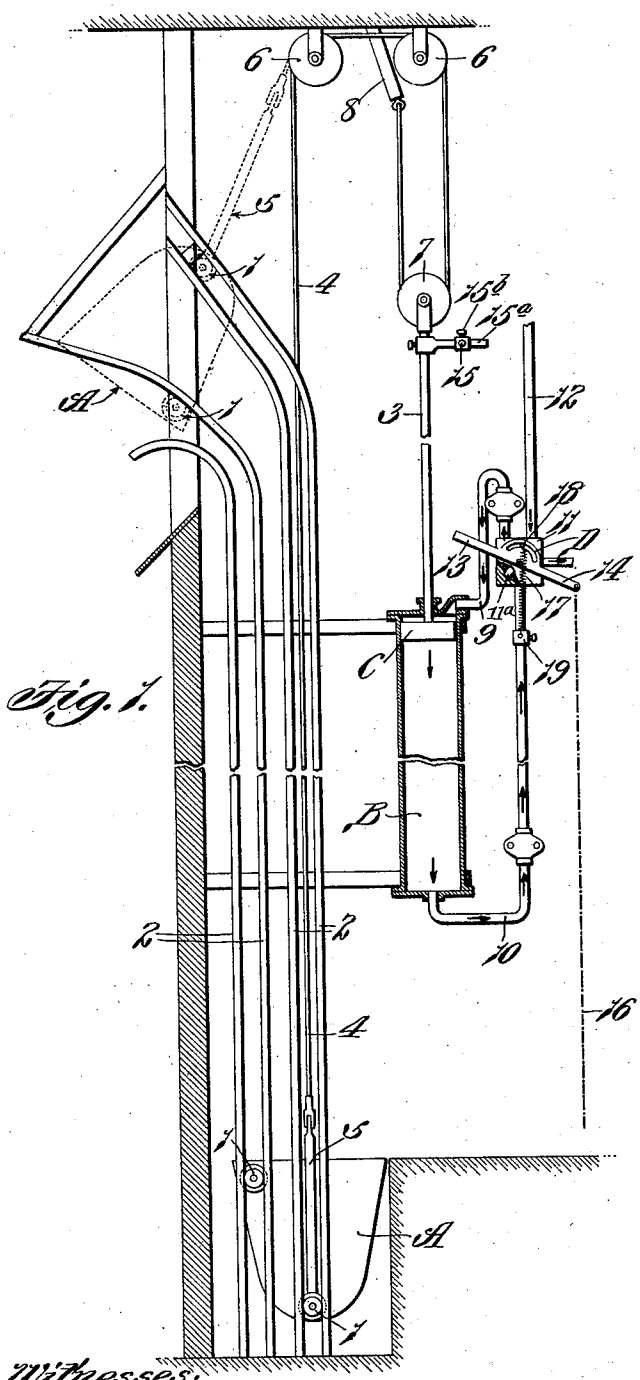
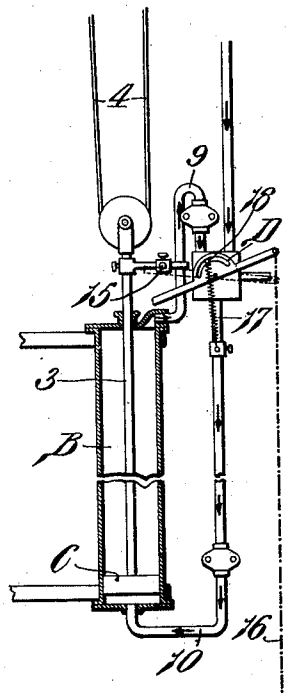


Fig. 1.

Fig. 2.



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AUTOMATIC-RETURN FLUID-OPERATED DEVICE.

1,079,613. Specification of Letters Patent. Patented Nov. 25, 1913.

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To all whom it may concern:

Be it known that I, GEORGE F. STEEDMAN, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Automatic-Return Fluid-Operated Devices, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to fluid-actuated operating devices of the type that comprise a cylinder provided with a piston that causes a carrier or other controlled member to travel in one direction on the forward stroke of the piston and in the opposite direction, back to its normal position, on the return stroke of the piston, the device being equipped with a valve for governing the flow of the operating fluid to the cylinder.

The main object of my invention is to provide an automatic return device or attachment for fluid-actuated hoists that will automatically return the piston to its starting position and which is so designed that it can be adjusted so as to vary the rate of slowing down of the piston prior to the automatic reversal of the piston, to vary the length of stroke of the piston, and to vary the velocity of the piston at the moment of reversal. With an automatic return device of the character above-mentioned, the piston may be made to reverse either rapidly, with practically no retardation in velocity before reversal, or it can be made to travel through part of its stroke at a high velocity and gradually slow down and linger a considerable time near the reversal point and then reverse and return automatically to its starting point at any velocity required.

Another object is to provide an automatic return device of the character described which is positive in action, has no delicate parts to wear, break or get out of order, is entirely exposed, is easily and accurately adjustable, and is in all respects a thoroughly reliable automatic returning or reversing device for a fluid-actuated hoist.

I have herein illustrated my invention embodied in a fluid-actuated hoist that is used for operating a bucket which travels vertically from a lower to a higher level and automatically discharges its load but I do not wish it to be understood that the invention is limited to this particular use as it is applicable to various kinds of fluid-operated devices that move a carrier or other controlled member back and forth between two points either in a vertical or horizontal direction.

Figure 1 of the drawings is a side elevational view, partly in vertical section, of an automatic return fluid-actuated hoist constructed in accordance with my invention, used for operating a bucket which travels upwardly from a higher to a lower level and automatically discharges its load; and Fig. 2 is a vertical sectional view of the hoist showing the parts of same in a different position.

Referring to the drawings which illustrate the preferred form of my invention, A designates the carrier or member to be operated, herein shown as a bucket provided with guides 1 that coöperate with vertically disposed tracks 2 which are so formed that the bucket will tilt automatically and thus discharge its load when it reaches a certain point in its upward travel.

The hoist that operates the bucket consists of a cylinder B provided with a piston C whose piston rod 3 is operatively connected to a cable 4 that is fastened to a bail 5 on the bucket, the cable 4 preferably leading from the bail of the bucket upwardly over guide pulleys 6, thence downwardly under a pulley 7 on the piston rod 3 and upwardly to a stationary bracket 8. The operating fluid is supplied to the upper and lower ends of the cylinder B by means of pipes 9 and 10, respectively, that lead to the casing 11 of an oscillating valve 11^a which is so designed that the operating fluid can pass from a supply pipe 12 into the upper end of the cylinder when the valve is in one position and into the lower end of the cylinder when said valve is in a different position. The stem of said valve is provided with an operative device D which has two laterally projecting arms 13 and 14, the arm 13 being so arranged that it will coöperate with a tripping member 15 carried by the rod 3 of the piston C, and the arm 14 being provided with a chain 16 or other suitable manipulating device for enabling the valve to be moved manually. The tripping member 15 is so arranged that it will engage the arm 13 on the valve-operating device D and thus move the valve automatically to diminish the supply of fluid to the upper end of the cylinder B when the piston C approaches the lower end of the cylinder, but said tripping member does not move the arm 13 far enough to completely cut off the supply of

fluid through the pipe 9. The movement of the valve to positively cut off the supply of fluid through the pipe 9 and also open the pipe 10 which leads to the lower end of the cylinder is effected by means of a spring 17 which is connected to the valve-operating device D in such a manner that it will throw the valve over center after the arm 13 has been moved to a certain position by the tripping member 15, the terms "over center" or "center position of the valve" being herein used to designate that portion of the travel of the valve when said valve is in its neutral position as regards admission and exhaust of the operating fluid from the center. In the embodiment of my invention herein shown the spring 17 is connected at its upper end to a pin 18 on the valve-operating device D, and the lower end of said spring is connected to a member 19 adjustably mounted on the pipe 10 or on any other suitable support so as to enable the tension of the spring to be varied. The pin 18, to which the upper end of the spring 17 is connected, is adjustably mounted in an arc-shaped slot in the device D and is set off center or at one side of the center of oscillation of the device D. After the bucket A has been filled, the operator pulls downwardly on the chain 16 so as to move the valve-operating device D into the position shown in Fig. 1 and thus permit the operating fluid to enter the upper end of the cylinder B through the pipe 9 and move the piston C downwardly, the fluid on the under side of the piston escaping through the pipe 10 whose upper end now registers with the exhaust port in the valve. When the tripping member 15 on the piston rod 3 strikes the arm 13 of the valve-operating device D the valve will be moved so as to diminish the supply of fluid through the pipe 9 but not completely cut off the supply, causing the piston to move more and more slowly until the tripping member moves the valve-operating device D into such a position that the adjustable stop 18 to which the spring 17 is connected passes across the center of oscillation of the valve and as soon as this occurs said spring will move the valve-operating device into the position shown in Fig. 2, thereby cutting off the flow of fluid through the pipe 9 and also establishing communication between the fluid supply pipe 12 and the pipe 10 that leads to the lower end of the cylinder B, the various coöperating parts being so arranged that the piston C will reverse automatically and begin to move toward the upper end of the cylinder after the bucket A has discharged its load, as shown in broken lines in Fig. 1. The fluid now enters the lower end of the cylinder and moves the piston C upwardly thereby causing the bucket A to move downwardly back to the point where it is filled, the piston coming to rest when it reaches the upper end of the cylinder and remaining in this position until the operator again pulls the chain 16 which shifts the valve into position to permit the escape of the fluid on the under side of the piston and admit fluid to the upper end of the cylinder. The gradual closing of the valve by the tripping member 15 cushions the shock of the piston as it approaches the lower end of the cylinder and thus prevents the bucket A from receiving a sudden shock or jar as it approaches the point where its direction of travel is reversed, and in order that this cushioning effect and the movement of the bucket may be regulated accurately, I have designed the tripping member 15 in such a manner that it can be adjusted with relation to the arm 13 of the valve-operating device. In the present embodiment of my invention as shown in Fig. 1 the tripping member 15 is mounted on a laterally projecting arm 15^a on the piston rod 3, and a set screw 15^b or other suitable device is provided for holding said tripping member in adjusted position. When the tripping member is arranged near the outer end of the arm 15^a said member will engage the arm 13 on the device D close to the center of oscillation of said device and thus impart a comparatively quick or sudden movement to the valve, but when the tripping member 15 is arranged nearer to the inner end of the arm 15^a it will engage the arm 13 of the device D at a point farther away from the center of oscillation of said device and thus impart a slow or gradual movement to the valve. Consequently, the rate of slowing down of the piston prior to the automatic reversal, or, in other words, the distance between the point where the bucket is at the time when the valve begins to slow down the piston and the point where the bucket is when the valve automatically reverses, is simply adjusted through a wide range in the manner above-described.

With a fluid-actuated operating device of the construction above described it is not necessary for the operator in charge of the device to watch the device constantly and manually turn the fluid-controlling valve so as to cause the carrier or bucket A to move back to its starting position and consequently the operator can fill another bucket or attend to something else while the bucket that has previously been filled moves to its point of destination, discharges its load, and returns to its starting position. Furthermore, the device is substantial and has no delicate parts to wear, break or get out of order; it is positive in action; it is entirely exposed; it is easily and accurately adjustable, and is in all respects a thoroughly reliable automatic return or reversing device for a hoisting apparatus. The

tripping member is adjustable up and down on the rod 3 so that the point in the travel of the piston for striking the operating member D can be adjusted, thereby enabling the length of stroke of the piston to be regulated, this being effected in the embodiment of my invention herein shown by adjusting the arm 15ª longitudinally of the piston rod 3, said arm being retained in adjusted position on said piston rod by means of a set screw, as shown in the drawings. As previously stated, the pin 18 to which the spring 17 is attached is adjustable in an arc on the operating lever D so that the point in the arc of operation of the valve where the spring causes the valve to jump by the center and reverse the piston travel is adjustable. Consequently, the velocity of the piston at the moment of reversal can be varied by moving the pin 18 in the arc-shaped slot in the valve-operating lever so as to alter the effective area of the opening of the valve ports at the moment when the automatic reversal occurs.

With an automatic return device having the adjustments previously described the piston may be made to reverse either rapidly with practically no retardation in velocity before reversal, or it can be made to travel through part of its stroke at a high velocity and gradually slow down and linger a considerable time near the reversal point and then reverse and return automatically to its starting position at any velocity required. There are many obvious arrangements of this device and I do not limit myself to the specific device shown.

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

1. In a fluid-actuated operating device, a cylinder, a piston in said cylinder, a valve for controlling the supply of fluid that actuates the piston, an arm connected to said valve, a tripping member adjustably connected to the piston rod and adapted to cooperate with said arm to automatically move said valve, and a spring eccentrically connected to said arm for completing the movement of said valve after it has been shifted into a certain position by said tripping member.

2. An automatic return device for a fluid-actuated hoist, consisting of a valve which controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever for moving said valve, an actuating device on the piston rod of the cylinder arranged to contact with the valve lever and move it, and a spring device arranged to pull the valve lever over the dead center of the valve, said actuating device being adjustable longitudinally of the piston rod.

3. An automatic return device for fluid-actuated cylinders of the direct-acting type, consisting of an oscillating valve which controls the admission and exhaust of the operating fluid to and from the cylinder, an operating arm on said valve, a device to throw said valve over the center position, and an arm on the piston rod arranged to operate the arm on the valve, the arm on the piston rod being adjustable longitudinally and radially with relation to the piston rod.

4. An automatic return device for fluid-actuated cylinders of the direct-acting type, consisting of a valve which controls the admission and exhaust of the operating fluid to and from the cylinder, an operating arm on said valve, a device to throw said valve over the center position, an arm on the piston rod arranged to move the valve-operating arm, the arm on said piston rod being adjustable lengthwise or longitudinal of same so as to change the axial position of the piston in the cylinder at the time of reversal of motion of the piston, and an adjustable means for changing the length of the piston travel necessary to cause a reversal of the valve's functions.

5. An automatic return device for fluid-actuated cylinders of the direct-acting type, consisting of an oscillating valve which controls the admission and exhaust of the operating fluid to and from the cylinder, an operating arm on said valve, a device to throw said valve over the center position, an arm on the piston rod arranged to move the valve-operating arm, the arm on said piston rod being adjustable lengthwise or longitudinal of same so as to change the axial position of the piston in the cylinder at the time of reversal of motion of the piston, and an adjustable means for enabling the point of contact between the arm on the piston rod and the valve-operating arm to be moved nearer to or farther away from the center of oscillation of said valve-operating arm.

6. An automatic return device for fluid-actuated cylinders of the direct-acting type, consisting of a valve which controls the admission and exhaust of the operating fluid to and from the cylinder, an operating arm on said valve, a spring device to throw said valve over the center position, an arm on the piston rod arranged to move said valve-operating arm, the arm on said piston rod being adapted to be adjusted longitudinally thereon so as to change the axial position of the piston in the cylinder at the time of reversal of motion of the piston, and an adjustable means for changing the length of the piston travel necessary to cause a reversal of the valve's functions, said spring device being adjustable so as to alter the relative opening of the exhaust and admission ports of the valve at the moment of automatic reversal.

7. An automatic return device for fluid-actuated cylinders of the direct-acting type, consisting of an oscillating valve which controls the admission and exhaust of the operating fluid to and from the cylinder, an operating arm on said valve, a spring device to throw said valve over the center position, said spring device being adjustable so as to alter the relative opening of the exhaust and admission ports of the valve at the moment of reversal, actuating means on the piston rod arranged to operate the valve-operating arm for the purpose of automatic reversal, said actuating means being capable of being adjusted so as to change the relative position of the piston in the cylinder at the moment of automatic reversal, and means for varying the point of application of the connection between the actuating device on the piston rod and the valve-operating lever nearer to or farther away from the center of oscillation of the valve so as to change the amount of travel of the piston in the cylinder necessary to cause automatic reversal of the valve.

8. In a fluid-actuated operating device, a cylinder, a piston in said cylinder, an oscillating valve for controlling the supply of fluid that actuates the piston, an arm connected to said valve, a tripping member adjustably connected to the piston rod and adapted to coöperate with said arm to automatically move said valve, a spring eccentrically connected to said arm for completing the movement of said valve after it has been shifted into a certain position by said tripping member, and means for varying the tension of said spring.

9. An automatic return device for a fluid-actuated hoist consisting of a valve that controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever for moving said valve, an actuating device on the piston rod of the cylinder adjustable longitudinally and radially thereon and arranged to operate the valve lever, and an adjustable spring device arranged to move the valve lever over the dead center of the valve.

10. An automatic return device for a fluid-actuated hoist consisting of a valve that controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever for moving said valve, an actuating device on the piston rod of the cylinder arranged to contact with the valve lever and move it, a spring device arranged to pull the valve lever over the dead center of the valve, and means for enabling said actuating device to be adjusted so as to vary the period in the point of travel of the piston that said device engages the valve-operating lever.

11. An automatic return device for a fluid-actuated hoist consisting of a valve that controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever for moving said valve, an actuating device on the piston rod of the cylinder arranged to contact with the valve lever and move it, a spring device arranged to pull the valve lever over the dead center of the valve, and means for enabling said spring device to be adjusted so as to vary the point in the movement of the valve where said spring causes the valve to jump by the center position of the valve.

12. An automatic return device for a fluid-actuated hoist consisting of a valve that controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever for moving said valve, an actuating device on the piston rod of the cylinder arranged to contact with the valve lever and move it, a spring device arranged to pull the valve lever over the dead center of the valve, means for enabling said actuating device to be adjusted longitudinally of the piston rod and also toward or away from the center of oscillation of the valve, and means for enabling said spring device to be adjusted so as to vary the point in the arc of operation of the valve where the spring causes the valve to jump by the center position of the valve.

13. An automatic return device for a fluid-actuated hoist consisting of a valve that controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever connected to said valve, a tripping device on the piston rod of the cylinder arranged to engage said valve lever and move it and designed in such a manner that it can be adjusted vertically and laterally, a spring for pulling the valve lever over the dead center of the valve, and a member on the valve lever that is adjusted in an arc to which one end of said spring is connected.

14. An automatic return device for a fluid-actuated hoist, consisting of a valve which controls the flow of the pressure fluid to the cylinder of the hoist, an operating lever for moving said valve, an actuating device on the piston rod of the cylinder arranged to operate said valve lever, and a spring device arranged to move the valve lever over the dead center of the valve, said actuating device being adjustable lengthwise of the piston rod.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this 16th day of November 1912.

GEORGE F. STEEDMAN.

Witnesses:
R. E. WINKLER,
LEON S. BUCKLES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."