

July 14, 1936.

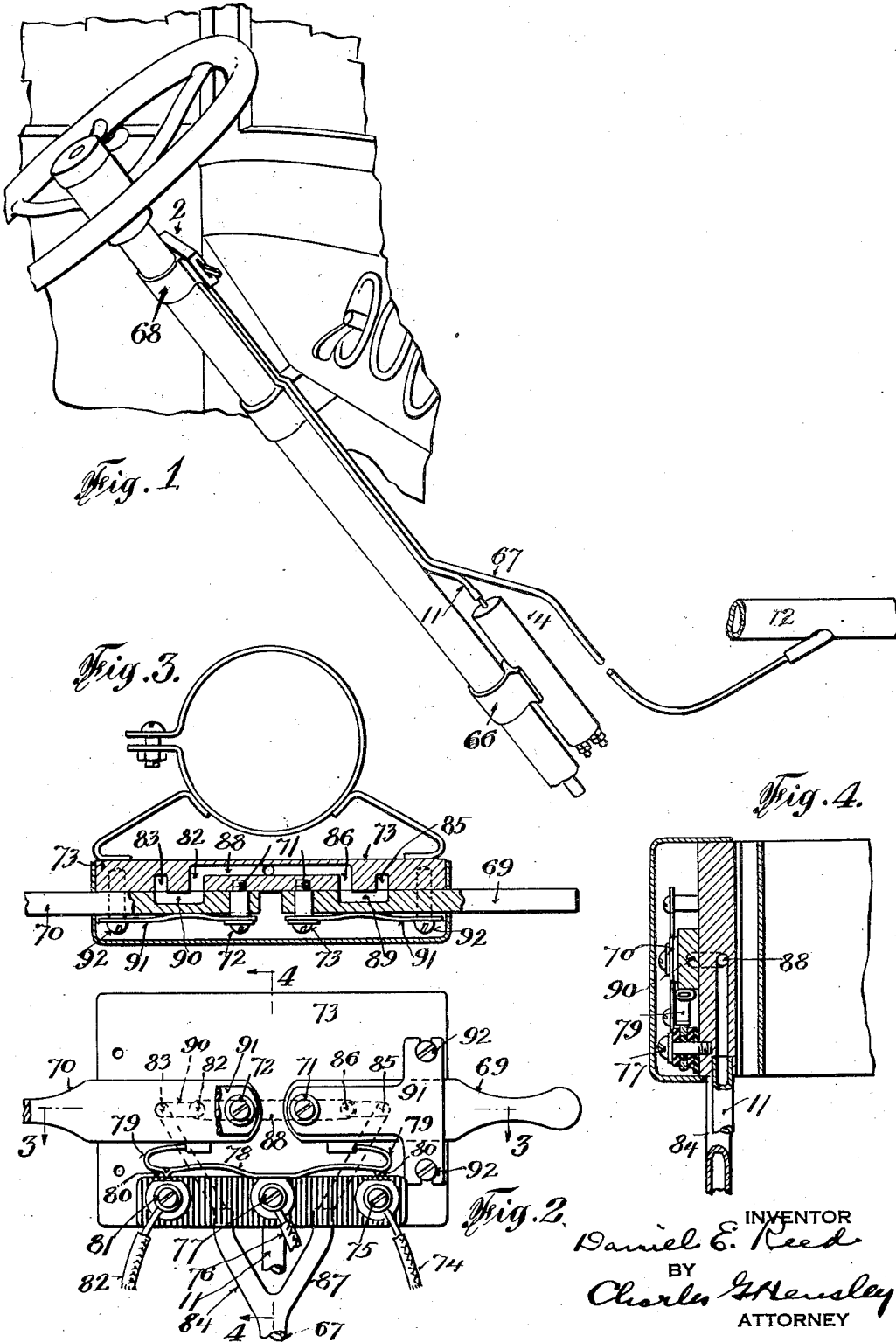
D. E. REED

2,047,382

FLUID OPERATED MOTOR

Filed Jan. 4, 1934

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

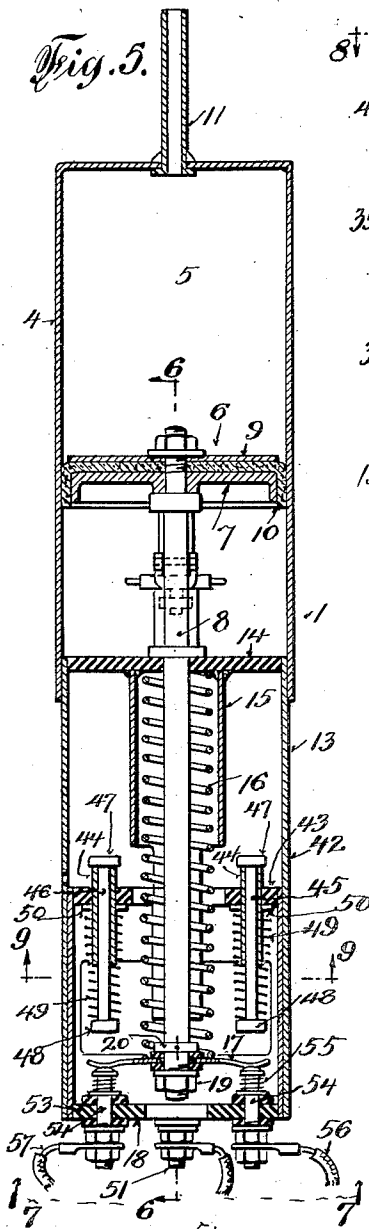
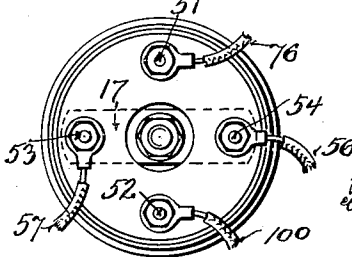
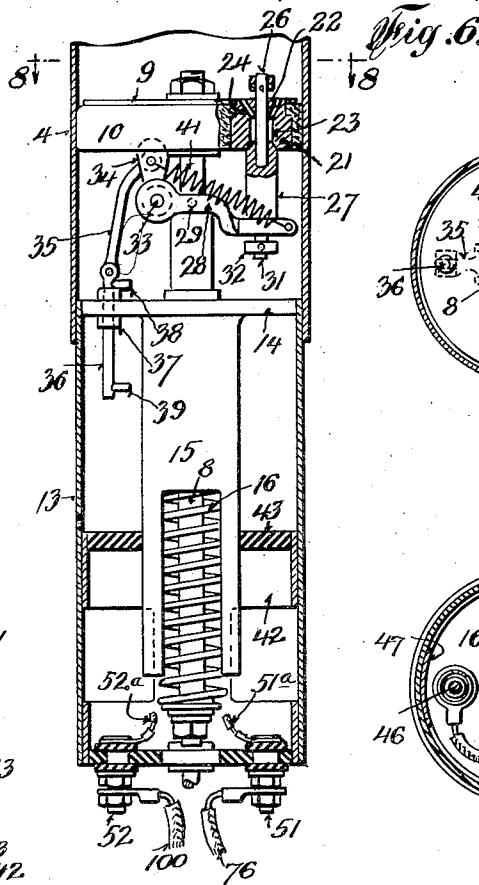
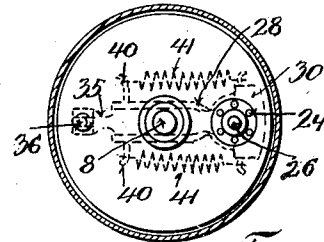
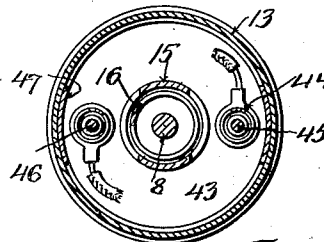


Fig. 7.

INVENTOR
Daniel E. Reed
BY
Charles E. Newley
ATTORNEY

UNITED STATES PATENT OFFICE

2,047,382

FLUID OPERATED MOTOR

Daniel E. Reed, Brooklyn, N. Y., assignor to Reed
Safety Signal System Inc., New York, N. Y., a
corporation of New York

Application January 4, 1934, Serial No. 705,229

4 Claims. (Cl. 121-123)

One of the principal objects of my invention is to provide a very simple and effective motor operated by a fluid, that is to say, either by the suction of the intake manifold of an automobile or by the exhaust of the engine, so that a fluid moving in one direction will effect the operation of the motor so that the latter reciprocates to cause the operation of any device actuated thereby.

This is provided with a piston which is acted upon by the operating fluid whether suction or air under pressure, and this piston is provided with and carries a valve which is automatically operated in accordance with the stroke of the piston to release the fluid from one side of the piston, so that the piston, after moving in one direction under the influence of the fluid means, will return under the action of a spring which is compressed during the movement of the piston in one direction by the fluid.

As far as I know, this is the first instance where a piston has been provided with a valve for releasing the pressure from one side of the piston to cause the return stroke of the piston so that a reciprocating motion is produced in the piston by a current of fluid moving continually in one direction.

Other features of my invention will be set forth in the following detailed description of one embodiment thereof.

In the drawings forming part of this application,

Figure 1 is a perspective view showing the steering post of an automobile with the parts of my invention attached thereto,

Figure 2 is a rear elevation of the switch device which is arranged near the steering wheel to control the operation of the signal,

Figure 3 is a sectional view taken on the line 3-3 of Figure 2,

Figure 4 is a sectional view taken on the line 4-4 of Figure 2,

Figure 5 is a vertical sectional view through the motor,

Figure 6 is a sectional view thereof taken on the line 6-6 of Figure 5,

Figure 7 is a sectional view taken on the line 7-7 of Figure 5 and comprising substantially an inverted plan view of the motor,

Figure 8 is a sectional view taken on the line 8-8 of Figure 6,

Figure 9 is a sectional view taken on the line 9-9 of Figure 5.

I have shown the motor forming my invention used to open and close electric circuits which may include an automobile signaling device or any other device, but it will be understood that the motor may be used for various purposes.

As shown in the drawings the motor is enclosed in the casing or shell 4, the upper end of

which in Figure 5 is provided with a chamber 5 in which the piston 6 reciprocates. This piston is shown as provided with a cup-like head 7 which is attached to a piston rod 8 and between this head and the washer 9 there is provided a leather or other pliable washer 10 which is turned over at the edge to engage the wall of the cylinder 4. The piston together with the piston rod 8 is adapted to reciprocate under the action of the operating fluid in the manner hereinafter described.

The chamber 5 in the cylinder above the piston is connected with a suitable fluid source which will exert a driving action on the piston, and in the preferred form of the invention there is a tube 11 connected with the upper end of the cylinder 4 which tube is connected in a manner to be hereinafter described, preferably with the intake manifold 12 of the motor of the vehicle so that a vacuum in this intake manifold will exert a suction action in the chamber of the cylinder to effect the upward movement of the piston.

There is a lower shell member 13 having its upper end immovably connected with the lower end of the cylinder 4 below the lowermost position of the piston; and this shell has a dividing wall 14 at its upper end which is preferably made of insulating material. There is a tubular member 15 fixed to and depending from this horizontal wall, which tubular member encloses and protects the spiral spring 16 which surrounds the piston rod 8 and which exerts an upward pressure at one end against the dividing wall 14 and at its lower end presses against the contact arm 17 which is secured to the piston rod by means of the flange 20 secured on the piston rod and by a nut and washer 19 threaded on the lower end of the rod. The contact arm 17 is preferably insulated from the piston rod by an insulating sleeve 18 so that current may pass through the contact arm but not through the piston rod.

The piston, as stated above, is provided with a valve for releasing the pressure on one side of the piston so that in the particular embodiment described herein the vacuum or suction above the piston may be released to permit the return stroke of the piston after it has been drawn upwardly by the suction or partial vacuum.

In Figure 6 I have shown a member 21 mounted in the piston to provide a valve seat 22 on the lower side of this member, together with a central bore 23; and above this bore there are converging apertures 24 which communicate at one end with the space above the cylinder, that is, with the chamber 5; and at their lower ends with the bore 23. There is a guiding spindle 26 extending through the central bore 23 where it is guided and on its lower end this spindle carries the valve 27 which has a conical top end

adapted to seat against the valve seat 22 to control the passage of fluid from one side to the other of the piston.

There is mounted on the piston rod 8 a yoke 5 shaped lever 28 pivoted on the pin 29 which passes through the arms of the yoke or lever and through the piston rod. The plate 30 on the ends of the arms of the lever 28 has an aperture through which projects a pin 31 fixed to the bottom of the valve 27 so that the swinging of the yoke 10 shaped lever will cause the rise and fall of the valve. There is a collar 32 secured to the pin 31 below the lever, so that when the lever is rocked in one direction it presses down on this 15 collar thereby lowering the valve 27; and when it is swung in the opposite direction it presses upwardly on the bottom of the valve body 27 to press the upper end of the valve against the seat 22. It will be noticed that when the lever 20 arm 28 is in its upper position as shown in Figure 6, holding the valve 27 closed, that the collar 32 is spaced from the lever arm 28 so that there is lost motion between the lever arm 28 and the collar 32. This permits the springs 41 to pass 25 the center of the pin 33 and to exert a definite downward pull on the lever arm 28 before the latter contacts with the collar 32 to insure a quick snap opening of the valve 27. On the other end of the yoke shaped lever 28 there is 30 pivoted at 33 a lever arm 34 and to the free end of this lever arm there is pivotally connected a link 35 the other end of the link being pivotally connected with a rod 36 which slides vertically in the sleeve 37 which is fixed in an aperture of the dividing wall 14. The rod 36 has a stop 35 member 38 to engage either the top of the dividing wall 14 or the top end of the sleeve 37 and below the partition it has another stop member 39 which in one position of the rod 36 engages 40 the bottom end of the sleeve 37 to limit the motion of the rod.

The lever arm 34 has laterally extending projections 40 to which are connected the ends of coiled springs 41. The opposite ends of these 45 springs are connected with the plate 30 on the outer ends of the lever arms 28.

I have shown the casing of the motor as having a third or lower section 42 fitted within and secured to the intermediate section 13 and extending partway up the same. This third casing 50 member is shown as provided with a horizontal wall 43 which is preferably made of insulating material. There are shown two tubular members 44 extending through apertures in this wall and 55 projecting downwardly from the bottom of the wall to serve as guides for the vertically movable contact rods 45, 46. These rods each have a head 47 on one end adapted to seat against the top end of the tube 44 to limit the downward movement 60 of the rod and they also have heads or enlargements 48 at their lower ends adapted to engage against the bottom ends of the tubes 44 to limit the upward movement of the rods.

There is a spring 49 coiled around each rod 65 and its tubular guide, the upper ends of the spring pressing against the pins 50 projecting from the tubular members 44 and the lower ends of the springs press downwardly against the tops of the heads 48 of the rods. The normal tendency of these springs is to press the rods downwardly into the position shown in Figure 6. The 70 contact arm 17 carried by the lower end of the piston rod is adapted, when the piston rod moves upwardly, to make contact with the heads 48 and 75 to thereafter lift the rods 45, 46 so that the

plate spring 17 is in contact with the rods 45, 46 after the piston rod starts to move upwardly; and the spring arm 17 remains in contact with these rods during a part of the upward movement of the piston and during a part of the lowering 5 movement of the piston.

The spring arm 17 is disengaged from the rods 45, 46 between the time the rods are arrested in their downward movement by the engagement of the heads 47 with the tops of the tubular 10 members 44 and until the piston starts a successive upward movement. From this it will be apparent that the spring arm 17 is out of contact with the heads 47 during a portion of the 15 stroke of the piston and is in contact with both of the rods during part of the stroke. When the spring arm 17 is in contact with the rods 45, 46 it closes a circuit which includes the right or left stop signal as will be hereinafter pointed out, whereas when the spring arm 17 disengages from 20 the rods 45, 46 the circuit is broken and the right and left turn signals are extinguished. There is, therefore, a periodical making and breaking of the circuit between the rods 45, 46.

The tube 11 connected with the upper part 25 of the piston cylinder is connected with the intake manifold indirectly or through a controlling device which I will hereinafter describe. There will therefore be a suction action exerted from the intake manifold upon the air in the upper 30 portion of the cylinder 4 and this suction or partial vacuum continually tends to suck or lift up the piston in the cylinder against the action of the coiled spring 16 which is tending to hold the piston in its lowermost position. 35

The suction action caused by the exhaust of the intake manifold will draw upwardly the piston within the cylinder 4 when the valve body 27 is seated against the valve seat 22 as shown in Figure 6 because at this time no fluid can pass 40 the cylinder. During the condition shown in Figure 6 the coiled springs 41 are on the upper side of the axis of the lever 29 so that the springs tend to lift the lever arms 28 and therefore press the valve 27 against its seat. 45

The suction causes the piston to rise in the cylinder until the projection 39 on the rod 36 strikes against the stationary sleeve 37 mounted in the wall 14 and any upward movement of the piston after this contact occurs will cause, by 50 reason of the stoppage of the upper movement of the rod 36, the link 35 to act on the lever arms 34 and swing the latter counter-clockwise on their pivot 33 so that these arms snap down to a position where the springs 41 lie below the piv- 55 otal point 29 of the lever arms 28.

As soon as this occurs these springs will exert a downward movement on the arms 28 so that these arms swing downwardly and press against the collar 32 and thereby lower the valve body 60 to disengage it from the valve seat 22. As soon as this occurs, fluid may pass through the port 23 and the ports 24. Assuming that the device is connected with the intake manifold of the engine and that there is a suction or partial 65 vacuum above the piston, then when the valve 27 is opened as just described, air will rush in past the valve and through the ports 23, 24 and pass into the cylinder above the piston. When this occurs the pull of the suction or partial vacuum 70 on the piston will be released by reason of the air flowing through the piston into the suction chamber, to such an extent that the coiled spring 16 will immediately act on the piston rod to lower the piston. When the piston moves down- 75

wardly, the valve 27 will be in an open position until the projection 38 on the rod 36 engages the top of the stationary sleeve 36.

A slight continuation of the downward movement of the piston and the piston rod after the rod 35 has been arrested will cause the link 35 to swing the arms 34 upwardly or clockwise into the position shown in Figure 6, ready for another cycle of operation.

The latter action threw the springs 41 above the pivot of the lever arms 28 so that these springs then seat the valve 27 on the valve seat, as shown in Figure 6, whereupon the passage of air through the piston is stopped. When this occurs the piston is ready to make another upward stroke.

As long as the motor remains in operation the cycles above described will be repeated. The exact period or speed of reciprocation of the motor may be regulated either by selection of the spiral spring 16 of a certain strength or by making the tube 11 larger or smaller.

During the upward movement of the piston it has been explained that the contact arm 17 makes contact with the rods 45, 46 and remains in contact with them until the lower portion of the stroke of the piston is taking place. The reciprocating action of the piston, as described above, causes the arm 17 to close and open a circuit.

The motor here described may be used for other purposes than flashing a light.

It may be noted that the binding posts 51, 52 mounted on the bottom horizontal wall 53 which latter is preferably of insulating material, are connected by wires 51a, 52a to the sleeves 44 in which the rods 45, 46 reciprocate, whereby these rods are connected in the circuit.

The motor described above is attached, preferably, to the steering post, such as by a bracket 65 shown in Figure 1. The tube 11 connected with the motor, extends up the steering post to the switch device under the steering wheel; and there is a second tube 67 returning from the switching device and connected with the intake manifold 12. The switch device is shown attached to the upper portion of the steering post by the clamp 68 which surrounds the post. There are two levers 69, 70 pivoted at 71, 72 upon the base 73 of the switch and these extend beyond the base 73 to be operated by the hand of the driver.

In the switch base there are two ports 82, 83 on the left hand of the block in Figures 2 and 3 and to the port 83 there is connected a tube 84. On the right side of the switch base there are two similar ports 85, 86 and there is a tube 87 connected with the port 85; and this tube preferably merges or combines with the tube 84 to form a Y and the single tube 67 connected with this Y is the tube which is connected with the intake manifold as stated above.

There is a lateral port 88 in the base of the switch which connects the two ports 82, 86. The tube 11 connected with this lateral port is the tube which is connected with the upper part of the cylinder of the motor, as shown in Figure 1.

The switch arm 69 has a port 89 which, when the switch arm is thrown down, will form a connection between the ports 85 and 86 so that through the several ports the tube 67 connected with the intake manifold will be in communication with the tube 11 connected with the motor, so that the suction of the intake manifold will

operate the motor while the right hand signal is in operation.

In similar manner, the switch arm 70 is provided with a port 90 which, when the lever is moved downwardly, forms communication between the port 82 and the port 83. When this occurs, the tube 67 connected with the intake manifold is also connected with the tube 11 so that the motor is actuated by the suction of the intake manifold. It will be apparent, therefore, that whichever switch lever 69 or 70 is moved downwardly it will cause the tubes 67 and 11 to be in communication, or in other words, as far as the fluid device is concerned, the motor is set into operation, whichever switch lever is moved downwardly into circuit-closing position. When both levers are up, the port 82 is out of communication with the port 85 and the port 82 is out of communication with the port 83 so that at such times there is no communication between the tubes 67 and 11, and therefore the motor is idle.

I have shown plates 91 secured to the switch base by the several screws 92 and these plates are adapted to press the respective switch levers 69, 70 into close contact with the face of the switch base in order that there shall be no leakage between the switch arms and the base.

Operation

Assuming that the device is installed in the manner shown in the drawings, the operation of the device will be as follows: If the driver of the vehicle is about to make a right hand turn, he or she will throw the switch lever 69 downwardly and this will perform two operations. That is to say, it will press one end of the bowed spring 78 downwardly into contact with the binding post 75 and this will connect the two wires 74, 76 and therefore close the circuit which includes the right hand signaling lamp as far as the switch is concerned. Movement of the switch arm 69 downwardly causes the port 89 to connect the ports 85 and 86 and this places the tubes 67, 11 into communication, so that the suction of the intake manifold acts through the tubes and the interconnecting ports in the switch base and the suction created in the upper portion of the cylinder 4 of the motor causes the piston to be drawn upwardly against the resistance of the return spring 16.

When the piston moves upwardly to a point where the stop pin 39 on the rod 36 engages against the bottom of the sleeve 37 and the piston moves slightly beyond this point, the link 35 will draw over the lever arms 24 until the springs 41 have passed the pivot 29 of the lever arms 28. When this occurs the springs will exert a downward pressure on the lever arms 28 and this will cause the valve 27 to move downward and unseat.

As soon as this occurs air will rush through the port 23 and the ports 24 into the space above the piston, and this will destroy the partial vacuum above the piston and terminate the upward pull on the piston. As soon as this action takes place the spring 16 which has been compressed during the upward stroke of the piston will cause the piston and its rod to move downwardly while the valve 27 is still open. When the piston has nearly reached its lower position, the pin 38 on the rod 36 will engage the top of the sleeve 37 thus arresting the downward motion of the rod 36 and a slight further movement of the piston will cause the link 35 to rock the arms 34 upwardly or back to their previous position. This will throw the

springs 41 on the opposite side of the pivot 29, whereupon these springs will swing the arms 28 upwardly and cause the valve 27 to be seated against the seat 22. As soon as this occurs, the flow of air into the space above the piston will be shut off, the piston will again be subjected to the suction action of the intake manifold, and the above cycle of operations will be repeated.

At each upward stroke of the piston rod the contact spring 17 will make contact with the two rods 45, 46 and will remain in contact with these rods during part of the upward and the downward stroke of the piston, but when the piston is in the lower position the spring arm 17 will disengage from the two rods, 45, 46. As the rods are connected to the binding posts 51, 52, it will be apparent that the circuit which includes the right hand signal light will be intermittently opened and closed.

If the left switch arm is thrown down its connecting port 90 registers with the ports 82, 83 and this also serves to place the tubes 87, 88 into communication with each other through the ports in the switch. This will set the motor into operation the same as when the right hand switch was operated, and the motor will perform the same functions as before. The left hand lamp will continue to flash until the lever arm 79 is moved upwardly, whereupon the left lamp will be extinguished and the motor will cease to operate.

As stated above, the speed of operation of the motor is more or less determined by the size of the tube 11 and by the strength of the recoil spring 16 so that these two factors may be designed so that the motor will have a fairly definite speed of operation.

The motor is very simple in construction and operation and it is actuated by the fluid moved by the motor of the vehicle. It is much simpler than an electrical motor and unlike the latter it causes no drain on the battery of the vehicle because it is not electrically operated. Furthermore, an electric motor would require very great speed reduction, whereas the present motor may be designed to operate without gearing at the desired speed. As pointed out above, the present motor may be employed to operate for other purposes than that described herein.

I do not wish to be limited to a piston of the type shown herein as it will be apparent that the piston may be in the form of a diaphragm clamped around the edge with the piston rod connected with the center of the diaphragm. In the use of the term "piston" in the following claims, I do so with the intention of covering any type of piston.

Having described my invention, what I claim is:

1. A reciprocating motor adapted to be operated by a fluid moving in one direction, including a cylinder, a piston adapted to be operated in one direction by fluid in said cylinder, said piston having a port to permit the passage of fluid through the piston, a valve movable with the piston for controlling the passage of fluid through said port, a piston rod associated with the piston and a coiled spring acting on said piston rod to move the piston in the opposite direction to that affected by the fluid, a lever mounted on said piston rod for operating the valve, a lever arm pivotally connected with one arm of said lever, a spring connected with said second mentioned arm and with an arm of said lever, and means for

causing said second mentioned arm to be oscillated in relation to said lever to cause said spring to alternately open and close said valve.

2. A reciprocating motor adapted to be operated by a fluid moving in one direction, including a cylinder, a piston and a piston rod adapted to be operated in one direction by fluid in said cylinder, a spring acting on said piston rod for effecting the return stroke of the piston, said piston having a port to permit the passage of fluid past said piston, a valve for controlling said port, a lever mounted on said piston rod and adapted to operate said lever, and a lever arm mounted on one arm of said lever, a spring connecting said lever arm with one arm of said lever, a link connected with said lever arm, a rod connected with said link, a guide for said rod, and means on said rod to limit its movement in opposite directions, the reciprocation of said piston being adapted to cause the said lever arm to oscillate to cause said spring to pass to opposite sides of the pivot of said lever, whereby to effect the opening and closing of said valve in definite relation to the reciprocations of said piston.

3. A reciprocating motor adapted to be operated by a fluid moving in one direction, including a cylinder, a piston adapted to be operated in one direction by a fluid in said cylinder, a spring acting on said piston for effecting the return stroke thereof, said piston having a port to permit the passage of fluid past the piston, a valve for controlling said port and movable with the piston, a lever movable with the piston and adapted to open and close said valve, and means for operating said lever, including a lever arm and a spring connected with said lever arm and said first lever and adapted to be moved past the center of said first lever to exert tension to move said first lever in opposite directions when said spring passes the axis thereof, means actuated by the movement of said piston for operating said second mentioned lever arm to cause the spring to pass the axis of said first lever arm, the parts being so arranged that said first lever will actuate said valve only after said spring has passed the center of said lever.

4. A reciprocating motor adapted to be operated by a fluid moving in one direction, including a cylinder, a piston adapted to be operated in one direction by a fluid in said cylinder, a spring acting on said piston for effecting the return stroke thereof, said piston having a port to permit the passage of fluid past the piston, a valve for controlling said port and movable with the piston, a lever movable with the piston and adapted to open and close said valve, the parts being designed to provide lost motion between said lever and said valve whereby the lever may have an initial movement before opening said valve, and means for operating said lever, including a lever arm and a spring connected with said lever arm and said first lever and adapted to be moved past the center of said first lever to exert tension to move said first lever in opposite directions when said spring passes the axis thereof, means actuated by the movement of said piston for operating said second mentioned lever arm to cause the spring to pass the axis of said first lever arm, the parts being so arranged that said first lever arm will actuate said valve only after said spring has passed the center of said lever.

DANIEL E. REED.