

Sept. 30, 1924.

1,509,843

C. S. RICKER

THREE-WAY VALVE

Filed Jan. 5, 1921

2 Sheets-Sheet 1

Fig. 3.

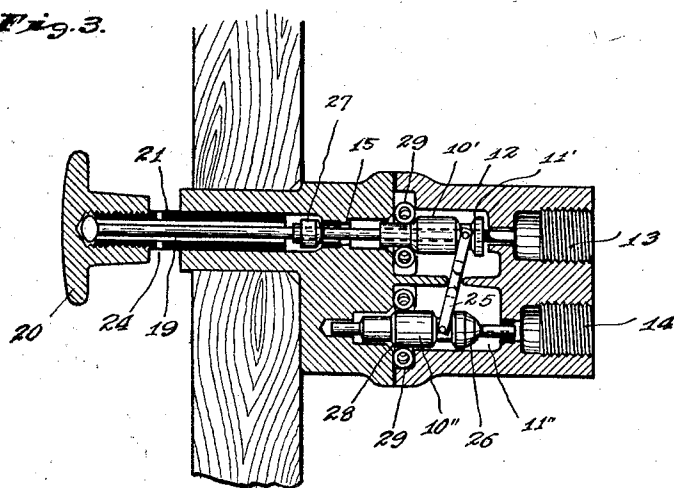


Fig. 1.

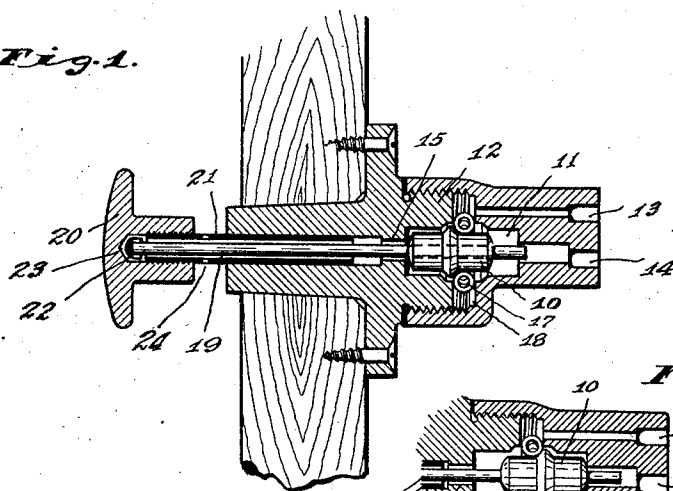
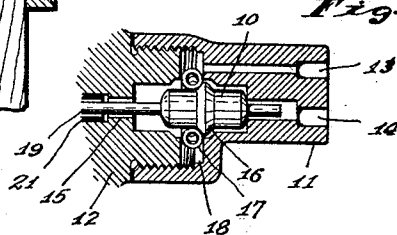


Fig. 2.



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Fig. 5.

Fig. 4.

Fig. 6.

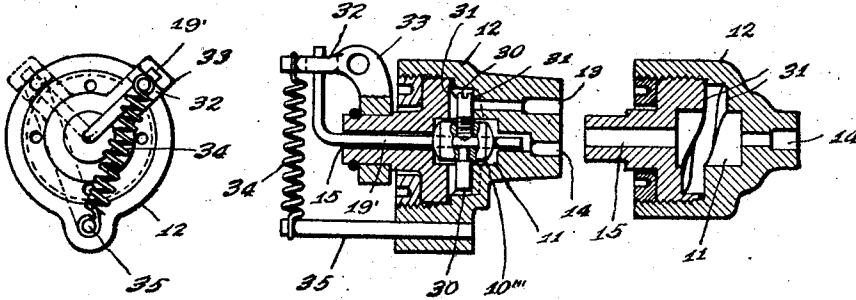
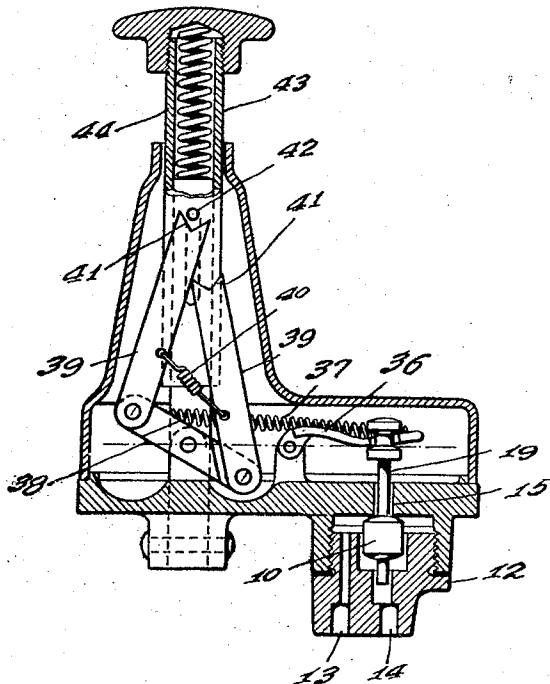


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHESTER S. RICKER, OF INDIANAPOLIS, INDIANA.

THREE-WAY VALVE.

Application filed January 5, 1921. Serial No. 435,079.

To all whom it may concern:

Be it known that I, CHESTER S. RICKER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Three-Way Valve, of which the following is a specification.

There is an increasing tendency in automobile work to use the vacuum produced in the intake manifold for operating various devices, and this requires a three-way valve which connects the vacuum-operated device either to the intake manifold or to the atmosphere at will.

It is the object of my present invention to provide a packingless three-way valve which will be positively pressed against its seat, by a spring, and in which the spring pressure will be assisted by the atmospheric pressure in one or both positions of the valve.

In carrying out my invention, I provide a valve casing having ports connected respectively to the atmosphere, to the intake manifold or other source of suction, and to the vacuum-operated device, the first two of which ports are controlled by a suitable valve member or valve members, and I extend the operating member for such valve member loosely through the atmosphere port. My valve is not limited, however, to the particular use referred to.

The accompanying drawings illustrate my invention in rather diagrammatic form: Fig. 1 is a central longitudinal section through a simple form of valve embodying my invention, with the valve member moved to close the atmospheric port; Fig. 2 is a fragmentary view similar to the right-hand part of Fig. 1, showing the valve member moved to close the port leading to the intake manifold; Fig. 3 is a central longitudinal section through a modified form of valve, in which there are two interconnected valve members both of which when in port-closing position are pressed to their seats by atmospheric pressure; Fig. 4 is a view generally similar to Fig. 1, but with operating mechanism which actuates the valve member by turning on a cam; Fig. 5 is a front

elevation of the structure shown in Fig. 4; Fig. 6 is a longitudinal section through the valve of Fig. 4, with the movable valve member removed, but is taken on a plane at right angles to that on which Fig. 4 is taken; and Fig. 7 is another view generally similar to Fig. 1, but showing an operating mechanism which shifts the valve in opposite directions on alternate depressions of the push button.

Referring first to the simple form of my three-way valve shown in Figs. 1 and 2, there is a shiftable valve member 10 shiftable to either of two positions in a valve chamber 11 provided in a casing 12, shown as made of two parts which may be separated to give access to the chamber 11. The valve chamber 11 has three ports 13, 14, and 15, the port 13 being connected to the vacuum-operated device, the port 14 to the intake manifold or other source of vacuum, and the port 15 to the atmosphere. The port 13 communicates laterally with the chamber 11, so that it opens to such chamber regardless of the position of the valve member 10; but the ports 14 and 15 communicate with such chamber at opposite ends thereof in the line of the axis of the valve member 10, which has guide projections extending loosely into such ports. The entrances from the chamber 11 to the ports 14 and 15 form opposite valve-seats for the valve member 10, which engages such two seats when it is in its two end positions as illustrated in Figs. 1 and 2 respectively. The valve member 10 when it engages either of such seats is spring-pressed thereagainst, the spring pressure as shown being obtained by providing the valve member 10 with an intermediate rib 16 tapered on both sides and arranged in position to cooperate with a circular coiled contracting spring 17 located in a circumferential groove 18 provided in the valve chamber 11, such groove being between the two parts of the casing in the arrangement shown.

One of the guide extensions for the valve member 10 is extended to form an operating rod 19. This operating rod extends loosely through the atmospheric port 15, so that

it does not interfere with the passage of air through such port, but makes packings unnecessary. I prefer to mount the operating handle 20 on a sliding sleeve 21 having a guiding mounting in the casing 12 and loosely surrounding the rod 19, and I provide a lost-motion connection between the handle 20 and the operating rod 19, as by providing a head 22 on such operating rod 19 within a chamber 23 which is in the operating handle 20 and is longer than such head; but such lost motion connection is not necessary to my invention. The sleeve 21 is provided with lateral vents 24, so that the communication from the valve chamber 11 to the atmosphere is through the port 15, the sleeve 21, and the vents 24.

The valve is operated by pushing in or pulling out on the handle 20. This shifts the valve member 10 from one position to the other, to connect the port 13 either to the atmosphere or to the source of vacuum, as is illustrated in Figs. 2 and 1 respectively. When the valve is in the position shown in Fig. 2 it is pressed against its seat not only by the spring 17 but by atmospheric pressure also. By reason of the lost motion between the handle 20 and the rod 19, and of the action of the spring 17 on the tapered rib 16, the valve member 10 moves with something of a snap action on to its respective seats, and cannot be held or left in an intermediate position.

In the arrangement shown in Fig. 3, the two-part casing 12 has two interconnected valve chambers 11' and 11'', provided between them with the same three ports 13, 14, and 15 communicating respectively with the vacuum-operated device, the intake manifold or other source of suction, and the atmosphere. The ports 13 and 15 open to the chamber 11', and the port 14 to the chamber 11'', and there are separate shiftable members 10' and 10'' in such two chambers. The member 10' is connected to an operating handle 20 by a rod 19 and a sleeve 21 exactly as described above in connection with Fig. 1, the rod 19 extending through the port 15; and the two members 10' and 10'' are interconnected by a lever 25 so that they must move simultaneously and in opposite directions. The member 10'' has a valve part 26 which cooperates with the entrance to the port 14 in the same way as does one end of the member 10 in Figs. 1 and 2, to control the communication of such port with the interconnected chambers 11' and 11''. The member 10', however, has no valve part within the chamber 11', but instead a valve member 27 is mounted on the rod 19 to cooperate with the outer end of the port 15, instead of cooperating with the inner end thereof as does the valve member 10 in Fig. 1. The members 10' and 10'' both have guiding projections, two of which

work loosely in the ports 13 and 14 respectively and one of which is the rod 19 working loosely in the port 15; and each of said members has a tapered surface 28 with which a coiled contracting spring 29 cooperates to press the valve member 26 or 27 against its seat.

The valve shown in Fig. 3 is operated with a snap action, by manipulating the handle 20, exactly as in the case of the valves of Figs. 1 and 2, and it is impossible to hold it in an intermediate position because of the lost motion between the handle 20 and the rod 19. To accomplish this result, the sloping surface 28 of the valve member 10' is preferably in such a position relative to the surface 28 of the valve member 10'' that the upper spring ceases to act on the sloping surface of the valve member 10' at substantially the exact position where the lower spring 29 begins to act on the sloping surface 28 of the valve member 10''. In both positions of the valve, moreover, the action of the spring 29 then tending to hold the valve to its seat is supplemented by atmospheric pressure, in the one instance (in the position shown) acting against the outer face of the valve member 27, and in the other acting against the outer face of the member 26.

In the arrangement shown in Figs. 4, 5, and 6, the casing 12 has the valve chamber 11 and the three ports 13, 14, and 15, substantially as in Figs. 1 and 2, and the ports 14 and 15 are in line with each other and controlled by a single valve member 10''' the operating rod 19' of which, projects through the atmospheric port 15. The valve member 10''', however, has a rotary as well as an axial movement, and for this purpose has two laterally projecting arms 30, which cooperate with the upper and lower helical cam surfaces 31 forming the end walls of the chamber 11. In order to turn the valve member 10''', its operating rod 19' is bent to form a crank which projects through a slot 32 in an operating arm 33 which may be swung to either side of a central position and is pressed toward either end position by a tension spring 34 connecting such arm to a fixed pin 35. By moving the arm 33 past its central position, it is snapped onward to the end position, thus turning the rod 19' and the valve member 10''' to cause the cam surfaces 31 to move such valve member axially from one of its seats to the other. The atmospheric pressure assists the spring 34 in holding the valve member 10''' to its seat when such valve member closes the port 14.

In Fig. 7, the two part casing 12 has the same ports 13, 14, and 15 as in the other case, and there is a single axially-movable valve member 10, as in Fig. 1, the operating rod 19 of which valve member projects

through the atmospheric port 15 as in the other cases. A circumferential groove in the outer end of the rod 19 receives a forked arm 36 which is connected by a tension spring 37 to the remote end of a centrally pivoted lever 38, from the opposite ends of which two pivoted arms 39, spring-pressed toward each other by a tension spring 40, project upward. The free ends of the arms 39 are provided with notches 41, either of which may cooperate with a laterally projecting pin 42 from the stem 43 of an outwardly spring-pressed plunger 44. By depressing the plunger 44, the pin 42 engages the notch 41 in that one of the arms 39 which is then uppermost, pushing such arm downward and tilting the lever 38 to its other position. When in this movement the spring 37 passes beyond the line of the pivot point of the lever 38, such lever is snapped onward to the position toward which it is traveling; and by the time the lever 38 reaches such position, the line of the spring 37 has passed the pivot point of the forked lever 36, and causes such lever to snap to its other position to move the valve member 10 from one position to the other. As one arm 39 is moved downward in the movement just described the other arm is moved upward correspondingly but the end of the upwardly moving arm slides along the side of the downwardly moving arm until the pin 42 is passed, so that there will be no interference with the movement; and when the spring plunger is released to move upward again, the spring 40 causes the arm 39 which has just been moved upward to move into position so that its notch 41 will lie in the path of the pin 42 when the plunger 44 is next pushed downward; so that upon such next depression of the plunger an opposite movement of all the other parts will be obtained from that caused by the previous operation. Thus alternate depressions of the plunger 44 produce opposite movements of the valve 10.

I claim as my invention:

1. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmosphere port and the source-of-suction port, and an operating rod for said valve means extending through said atmospheric port.

2. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmosphere port and the source-of-suction port, an operating rod for said valve means extending through said atmospheric port, and spring means tending to seat said valve means in either position.

3. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmospheric port and the source-of-suction port, an operating rod for said valve means extending through said atmospheric port, spring means tending to seat said valve means in either position, and spring means associated with said valve means and tending to move said valve means with a snap action and to produce valve seating in either position.

4. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmosphere port and the source-of-suction port, and an operating rod for said valve means extending through said atmospheric port, said valve means being arranged so that the pressure of the atmosphere tends to produce valve seating in at least one position.

5. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmosphere port and the source-of-suction port, and an operating rod for said valve means extending through said atmospheric port, said valve means being arranged so that the pressure of the atmosphere tends to produce valve seating in both positions.

6. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmosphere port and the source-of-suction port, an operating rod for said valve means extending through said atmospheric port, and spring means tending to seat said valve means in either position, said valve being arranged so that atmospheric pressure assists said spring in producing seating in at least one position.

7. A three-way valve, comprising a casing having ports for connection to a source of suction and to a vacuum-operated device and another port open to the atmosphere, valve means controlling the atmosphere port and the source-of-suction port, an operating rod for said valve means extending through said atmospheric port, spring means tending to seat said valve means in either position, and spring means associated with said valve means and tending to move said valve means with a snap action and to produce valve seating in either position, said valve being arranged so that atmospheric pressure assists said spring in producing seating in at least one position.

8. A three-way valve, comprising a casing

having three ports, valve means controlling an operating rod for said valve means extending through said atmosphere port. 10
two of said ports, and an operating rod for said valve means extending through one of said ports.

5 9. A three-way valve, comprising a casing having three ports, one of said ports communicating with the atmosphere, valve means controlling two of said ports, and
In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 29th day of December, A. D. one thousand nine hundred and twenty.

CHESTER S. RICKER.