

April 25, 1950

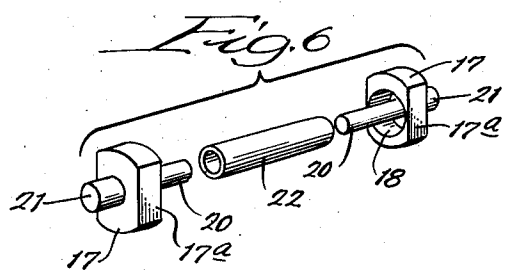
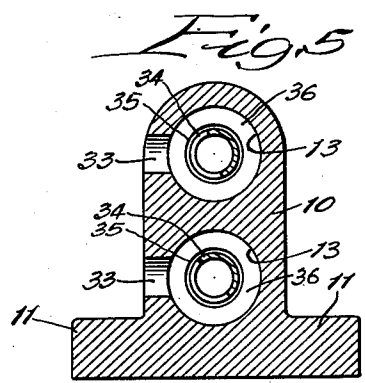
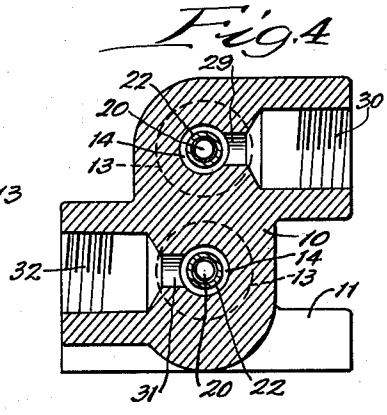
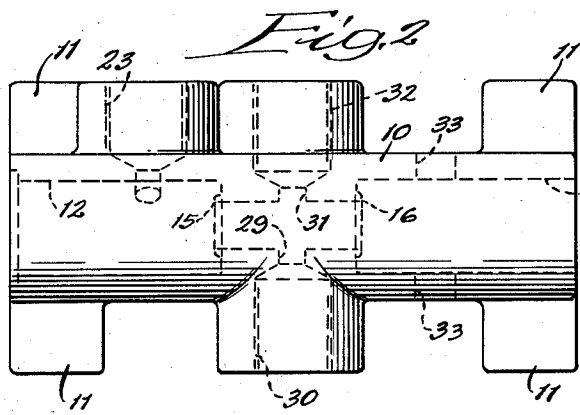
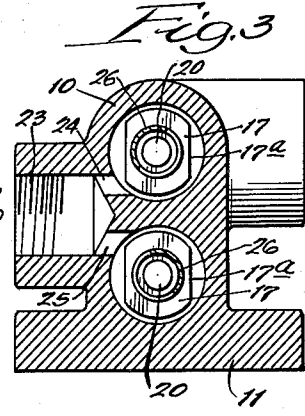
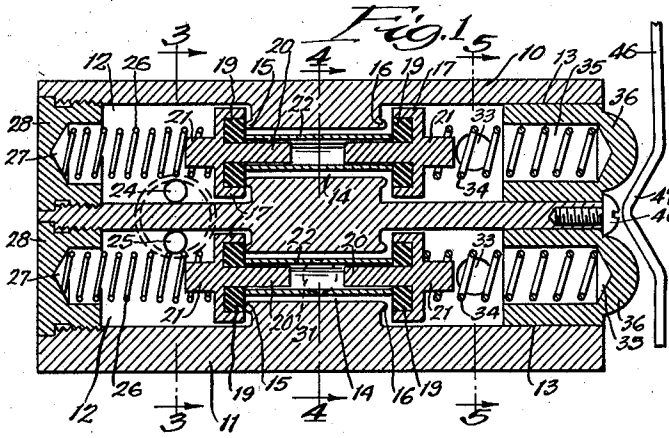
T. E. MEAD

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VALVE STRUCTURE

Filed Sept. 4, 1945

2 Sheets-Sheet 1



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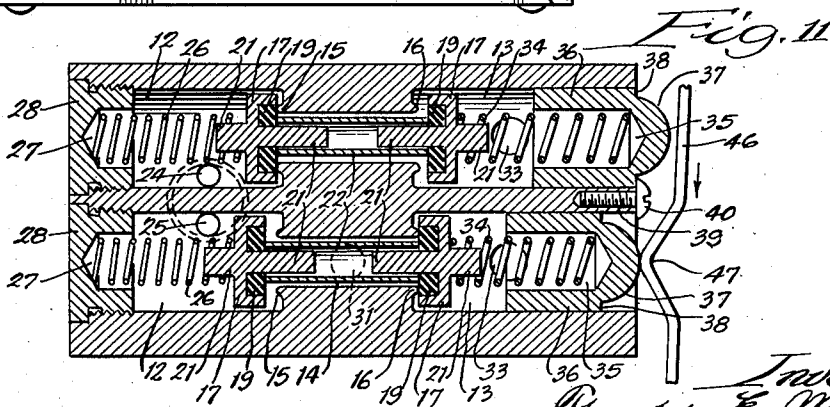
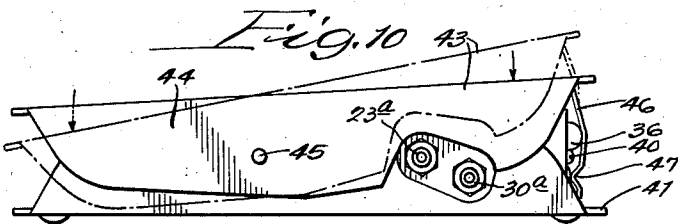
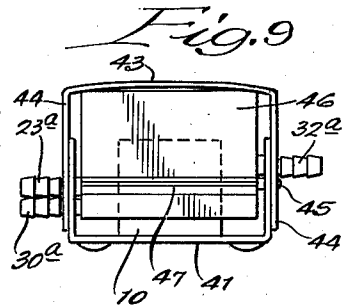
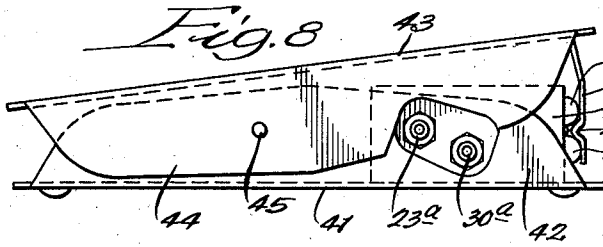
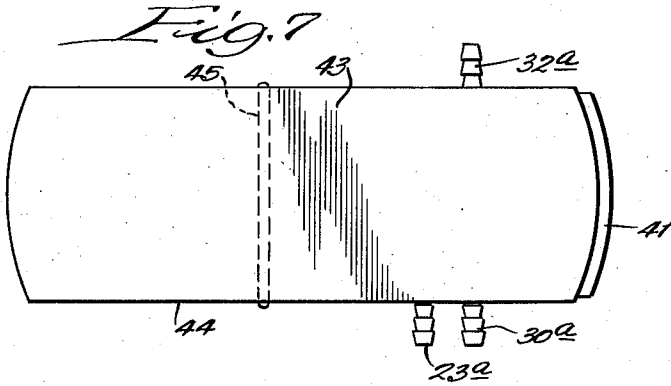
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VALVE STRUCTURE

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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

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## VALVE STRUCTURE

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4 Claims. (Cl. 277-20)

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This invention relates to a valve structure and to improved parts therein.

An object of the present invention is to provide a valve structure in which ready assembly of the parts may be effected and the parts selectively operated to direct pressure fluid from the intake to one of two work chambers or to an exhaust port. Another object is to provide a valve structure in which threaded connections for securing the valve parts in position are eliminated and in which a very simple assembly method is made possible. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in a preferred embodiment, by the accompanying drawing, in which—

Figure 1 is a longitudinal sectional view of apparatus embodying my invention; Fig. 2, a top plan view; Fig. 3, a transverse sectional view, the section being taken as indicated at line 3 of Fig. 1; Fig. 4, a transverse sectional view, the section being taken as indicated at line 4 of Fig. 1; Fig. 5, a transverse sectional view, the section being taken as indicated at line 5 of Fig. 1; Fig. 6, an exploded view of the valve and sleeve assembly; Fig. 7, a top plan view of the valve structure housed within mechanism for selectively operating the valves; Fig. 8, a side view in elevation of the structure shown in Fig. 7; Fig. 9, a front end view of the structure shown in Fig. 7; Fig. 10, a view similar to Fig. 8 but showing the actuating mechanism in different stages of operation; and Fig. 11, a longitudinal sectional view of the valve casing and similar to Fig. 1 but showing one of the valves in operation.

In the illustration given, a valve casing 10 is provided with a base 11 which is laterally extended to provide a firm support for the valve structure. The casing provides a pair of valve chambers running longitudinally of the casing. The inlet valve chamber 12 communicates with the outlet or exhaust valve chamber 13 through a constricted passage 14. The casing provides valve seats 15 and 16 at the points where the large chambers meet the constricted passages 14.

The valves engaging valve seats 15 and 16 are identical in construction and are shown in detail in Fig. 6. The valve head 17 is recessed on its inner side to provide a chamber 18 to receive the sealing plug 19 which may be of rubber, artificial rubber, or any other suitable flexible sealing material. Each head 17 has its sides cut away at 17<sup>a</sup> to provide spaces within the circular chambers 12 and 13 through which fluid may readily pass. Integrally formed with the head 17 is a stem 20 which projects inwardly

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within the narrow passage 14. Integrally formed with the head 17 but extending in the opposite direction is a boss 21 which secures a spring in alignment therewith. A sleeve 22 receives the stems 20 and abuts the sealing plug 19 of each valve head. With this assembly, the sleeve 22 serves as a means for communicating pressure from one valve head to the other and simultaneously maintains the resilient or flexible plugs 19 firmly within the recess 18 of each valve head.

As shown more clearly in Figs. 1 and 3, an inlet port 23 threadedly received within a fitting, communicates directly through ports 24 and 25 with the inlet chambers 12. A spring 26 in each of the chambers 12 engages the boss 21 and urges the corresponding valve head toward its seat. The rear end of the spring 26 is received within a seat 27 provided by the threaded plug 28 which closes the rear end of chamber 12. Communicating with one of the passages 14 is a port 29 which opens into a threaded port 30 from which a connection will lead to a work cylinder. A similar passage 31 leads from the other constricted passage 14 to a port 32 from which a threaded connection will lead to a work cylinder, etc., as shown more clearly in Fig. 4.

The exhaust chambers 13 are each provided with an outlet port 33. A spring 34, which is preferably heavier than spring 26, is mounted in each of the chambers 13 and on its inner end engages boss 21. At its outer end, the spring 34 is received within the recess 35 of the ball plunger 36. The plunger 36 is provided with a ball extension 37 and with narrow shoulders 38 adjacent the ball extensions 37. The casing is tapped at 39 to receive a screw 40 which overlaps the narrow shoulders 38 and serves to confine both plungers 36 in position. For disassembly it is only necessary to remove the screw 40 in order to remove both plungers 36 and their related parts.

Any suitable means for actuating the plungers 36 may be employed. I prefer to use the structure illustrated more clearly in Figs. 7, 8, 9 and 10. In this structure, the valve mechanism is carried by a base 41 provided with two vertical side walls 42. A treadle member 43 having depending sides 44 enclosing sides 42 is pivotally supported upon sides 42 by the shaft 45.

The fitting 23<sup>a</sup> communicates through the side wall 42 with the inlet port 23, and the fittings 32<sup>a</sup> and 30<sup>a</sup> likewise communicate through one of the side walls 42 with the ports 32 and 30 respectively.

The treadle member 43 is provided at its forward end with a depending actuator arm 46 which is provided at an intermediate point with a cam

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47. In normal position, the cam 47 lies between the plungers 36 and will selectively operate either one, depending upon the direction of tilting given the treadle member 43.

#### Operation

In the operation of the apparatus, the operator will tilt with his foot the treadle member 43 to selectively engage one of the plungers 36. When the plunger 36 is moved inwardly, it pushes spring 34 and thereby moves the valve 17 toward its seat 16. In normal operation, the valve 17 is slightly unseated so that the chamber 13 is in communication with the passage 14. Upon the movement just described, the valve 17 will bring the sealing plug 19 thereof into airtight engagement with the valve seat 16. At the same time, the thrust of the sleeve 22 against the plug 19 of the opposite valve head 17 will unseat that valve and will permit the inflow of air from chamber 12 into the passage 14 and thence into outlet passage 29 or 31, depending upon which valve is being actuated, to the corresponding work cylinder. Upon release of the selected plunger 36, the valve plug within the inlet chamber 12 will move to its initial position engaging the valve seat 15 and the fluid pressure within the chamber will hold the valve plug 19 thereof continuously in airsealing engagement with seat 15. At the same time, the thrust of sleeve 22 will unseat the opposite valve plug 19 in chamber 13 and permit air within the work cylinder to exhaust back through passage 14 into chamber 13 and out through exhaust port 33. The valves are extremely quick acting. A single inlet pipe feeds the inlet chambers which are in open communication with each other and thus insures the firm seating of the valves therein. In the operation, the sleeve 22 is the effective element in transmitting pressure from one valve to the other and at the same time the sleeve maintains the valve heads 17, by means of their stems received within the sleeve freely in alignment with their seats.

The assembly of the valve structure within the valve casing in prior practices has been extremely difficult and expensive because of the many parts and the threaded connections and the necessity of threading on parts while in the valve chamber. In the present construction, a simple unitary valve body is formed which, in a single piece, provides a hollow valve head for receiving the plug, a stem, and a spring lug. The valve plug in such a head would not remain in position against the air pressure which would pass behind the plug and force it outwardly, and in prior practices it has been necessary to form threaded stems upon which retaining nuts are threaded. In the present structure, applicant is able to avoid all such expense and difficulty of assembly by employing, instead of a common valve stem between the valve heads, a pair of short stems, each integral with its head and with a connecting sleeve between the two. With the open chamber structure shown, assembly is a rapid and easy matter. A valve head is dropped through the open end of the cylinder into one of the chambers so that the stem 28 extends within passage 14. The spring may be placed in position and the end of the passage sealed. The valve is then inverted and a sleeve dropped in the opposite end chamber and within passage 14. The other valve is dropped into the chamber with its stem received within the sleeve. The spring of that chamber is then inserted and the end closed. In the four-way valve structure illustrated, the two chambers are filled simulta-

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neously at one end of the structure before the structure is up-ended to fill the other end. It takes but a moment to complete assembly. The assembly is accurate and the parts are necessarily aligned when the assembly is completed.

In Fig. 11 the actuation of one of the plungers by the cam 47 of actuator 46 is shown. By the inward pressure exerted upon spring 34, the valve is urged inwardly and seals seat 16. The sleeve 22 presses against the opposing valve and moves it away from seat 15. The incoming fluid may, therefore, pass off through the port 32. When the actuator member 46 is raised so as to engage the upper plunger 36 and move it inwardly, the same movement of the valves will cause fluid to pass out through port 30.

In the structure illustrated in Figs. 7 to 10 inclusive, the valve mechanism is completely housed within the structure provided by the base 41, treadle member 43 and the telescoping side walls 42 and 44. The actuating lever 46 is conveniently suspended from the front of the treadle member 43 so as to actuate selectively either of the plungers 36 by slight tilting of the treadle member.

It will be understood that the new valve structure described herein, employing the sleeve and integral head and stem parts, may be employed in single-passage air valves as well as in the multiple passages herein described. Further, while the invention has been described herein in detail for the purpose of illustration, it will be understood that such details may be varied widely by those skilled in the art without departing from the spirit of my invention.

#### I claim:

1. In a valve structure, a casing providing a passage with spaced valve seats therein, valves facing said seats and each other, each of said valves having an integral valve stem extending toward the other valve but spaced therefrom, a sleeve snugly receiving said valve stems and having its ends abutting said valves, and a spring urging at least one of said valves toward its seat.
2. In a valve structure, a casing providing a passage with spaced valve seats therein, said valve seats being disposed at a point intermediate said passage and facing in opposite directions, said valves having cupped portions facing said valve seats and each other and having central integral stem portions extending between said valve seats but spaced from each other, and a centering sleeve snugly receiving said stems and having its ends abutting said valves, and spring means engaging at least one of said valves to urge the same toward its seat.
3. In a valve structure, a casing having a passage extending therethrough, said casing providing centrally of the passage a constricted portion providing at its ends spaced valve seats facing in opposite directions, poppet valves slideably mounted in said passage and facing said seats and each other, each of said valves having inwardly-extending stems, a sleeve snugly receiving said stems and spacing the same apart, the ends of said sleeve abutting said valves, said casing providing also ports communicating with said passage on either side of said valves, spring means urging one of said valves toward its seat and actuating means urging the other of said valves toward its seat.
4. In a valve structure, a casing providing a passage and valve seats spaced therein, said valve seats facing in opposite directions, valves having inner cupped portions facing said seats and each other, said valves having inwardly-extending stems, a sleeve snugly receiving said stems and

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spacing the same apart, at least one of said valves having an integral stem extending in the opposite direction from the said first-mentioned stem, a compression spring enclosing said second-mentioned stem, and a closure threadedly engaging the end of said casing to close said passage and to support one end of said spring.

THEODORE E. MEAD.

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