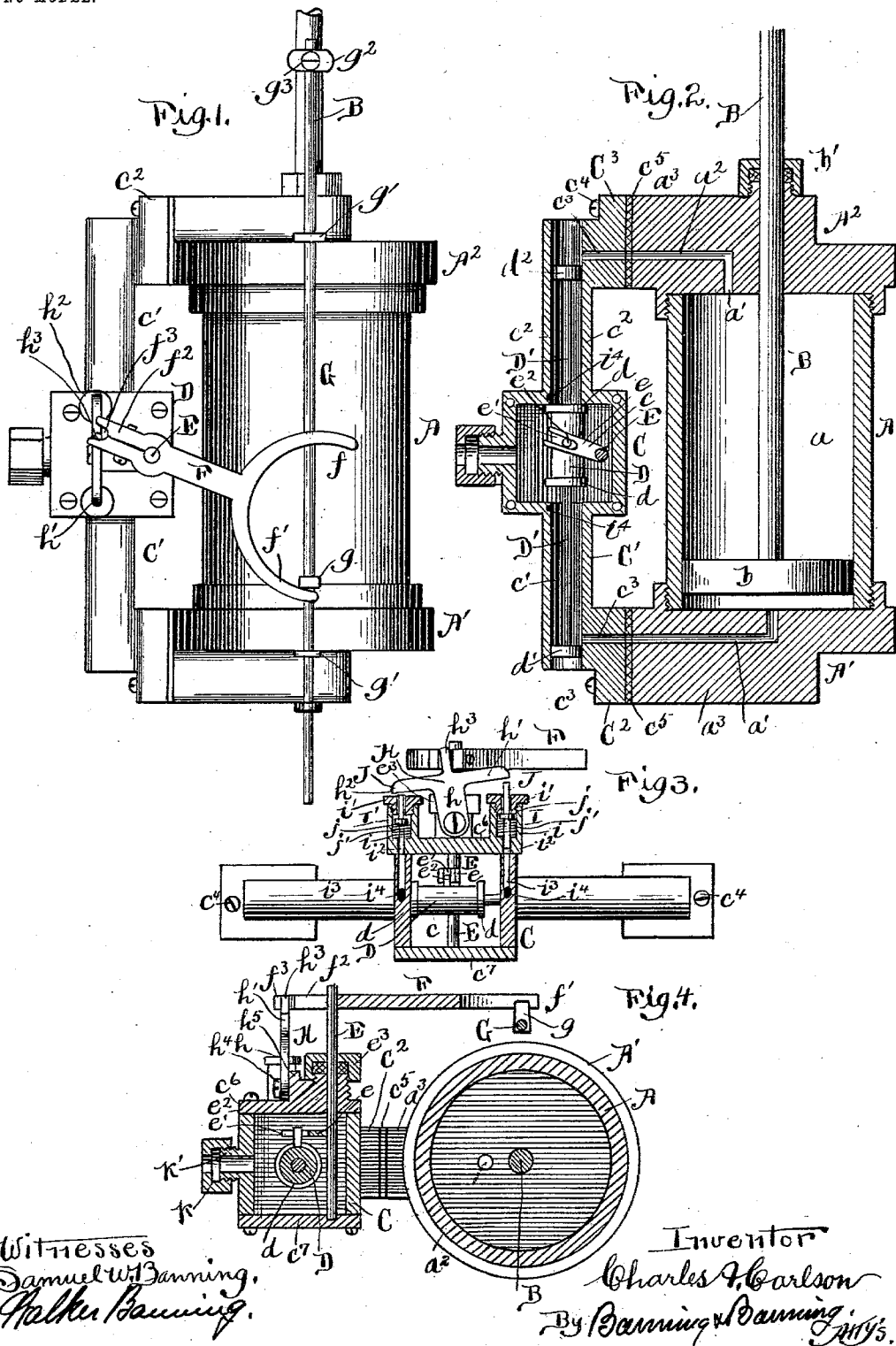


No. 748,928.

PATENTED JAN. 5, 1904.

C. A. CARLSON.
VALVE FOR FLUID PRESSURE MOTORS.
APPLICATION FILED NOV. 13, 1902.

NO MODEL.



UNITED STATES PATENT OFFICE.

CHARLES A. CARLSON, OF CHICAGO, ILLINOIS.

VALVE FOR FLUID-PRESSURE MOTORS.

SPECIFICATION forming part of Letters Patent No. 748,928, dated January 5, 1904.

Application filed November 13, 1902. Serial No. 131,120. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. CARLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Valves for Fluid-Pressure Motors, of which the following is a specification.

The objects of this invention are to construct a valve for fluid-pressure motors by which the induction and eduction of the fluid-pressure alternately into and out from the working cylinder of the motor will be attained in an efficient and reliable manner, to alternately shift the position of the valve from the strokes of the piston of the motor, to obviate back pressure on the valve from interfering with the quick movement of the valve, to alternately actuate the relief devices for the back pressure with the strokes of the piston of the motor, and to improve generally the construction and operation of the valve as a whole.

The invention consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation with the piston-rod of the motor broken off; Fig. 2, a sectional elevation with the piston and piston-rod of the motor in full elevation with the piston-rod broken off and showing also the controlling-valve and its rods in full elevation; Fig. 3, an elevation, partly in section, of the valve and the actuating means therefor; and Fig. 4, a sectional view through the cylinder of the motor and the chest of the valve.

The cylinder of the motor consists of a body A with end caps or heads A' and A², and the cylinder as a whole can be made of any suitable material. The body of the cylinder has a chamber a, and the cap or head A' has a passage a' for admitting pressure to one end of the chamber A, and the cap or head A² has a passage a² for admitting pressure to the opposite end of the chamber a for the pressure to act on the piston within the chamber. A piston-rod B, carrying a piston b, which operates in the chamber a, passes through the cap or head A² in the construction shown and is surrounded by a suitable

stuffing-box b', threaded onto a boss on the head.

The valve-chest C in the construction shown is rectangular and incloses a chamber c, and leading from opposite sides of the chest C are tubes C' and C², the tube C' having a passage c' and the tube C² having a passage c², extending from the chamber to the end of each tube. Each tube C' and C², at its outer end, has a head or block C³, extending through which in line with the passages a' and a² is a passage c³, furnishing communication between the passages of the tubes C' and C² and the interior of the motor-cylinder. The heads or blocks are attached to projections a³ on the caps or heads A' and A² by bolts c' or otherwise, and in order to make a tight joint between the passages leading from the valve-chest to the chamber of the motor-cylinder a suitable packing c⁵ is placed between the end face of the heads or blocks C² and the adjacent faces of the caps or heads, as shown in Figs. 1, 2, and 4. The chamber c has located and operating therein the valve D, which controls the induction and eduction of the pressure into and from the motor-cylinder. This valve D in the construction shown is cylindrical and has at each end a flange or attachment d, forming the faces for seating and closing the ends of the passages c' and c², which lead into the chamber c of the valve-chest. The valve D is movable on a sliding rod D', which rod D' extends beyond the ends of the cylinder and has at one end thereof a piston d and at the other end thereof a piston d², operating in the passages c' and c², respectively, of the tubes C' and C². The two pistons and rod form a double-headed piston, which when driven to the extremity of its downward stroke, as shown in Fig. 2, by the admission of pressure into the passage c' opens the lower passage c³ for the admission of pressure into the motor-cylinder and simultaneously opens the upper passage c³ for the eduction of pressure therefrom, it being understood that when one passage c³ is open for induction the opposite passage c³ is open for eduction and that the controlling-valve D is seated to close that one of the passages c' and c² which is in communication with the passage c³ that is open for eduction and is unseated to open communi-

cation into that one of the passages which is in communication with the passage c^3 that is open for induction.

A rock shaft or rod E is mounted in the walls of the valve-chest and extends across the chamber of the chest, as shown in Figs. 2, 3, and 4, the rod passing through the side plate or wall c^6 of the chest and having its inner end entered into a bearing in the side plate c^7 of the chest, which plates c^6 and c^7 are bolted or otherwise attached to the remaining walls or plates of the chest, and, as shown, the rock-shaft or rod E is surrounded at its projecting end by a stuffing-box e^3 , threaded onto a boss or flange on the plate or wall c^6 , so as to make a tight joint against the escape of pressure around the shaft or rod. The rock shaft or rod E has fixedly attached thereto within the chamber c an arm e , having a slot e' in its end, into which slot is entered a pin e^2 , projecting from the body of the cylindrical valve D at the center longitudinally of the valve. A lever F is fixedly attached to the projecting end of the rock-shaft or rod E, and its outer end is provided with an arm f and an arm f' , which arms are contacted by a tappet g , fixed on a reciprocating rod G, movably mounted in guides g' , extending out from the heads A' and A^2 in the construction shown, and one end of the rod is attached to a collar or eye g^2 on the piston-rod B, and, as shown, the rod is adjustable in the collar or eye g^2 and is held in its adjusted position by a set-screw g^3 or otherwise. The adjustment of the rod G is for the purpose of locating the tappet g thereon, so as to properly cause the tappet, with reciprocation of the rod, to alternately engage the arms f and f' of the lever F and vibrate or oscillate the lever to rock the shaft or rod E and cause the arm e to shift the controlling-valve D within the chamber c of the chest.

A lever H, having a central arm h and side arms h' and h^2 , is pivotally mounted by a pivot-bolt h^4 or otherwise to a wall h^5 on the plate or side wall c^6 of the valve-chest, and this lever has a central arm h^3 , which enters a slot or notch f^3 in an extended neck f^2 of the lever F, so that with the oscillating of the lever F the lever H will be reversely rocked or oscillated on its pivot. The plate or wall c^6 has thereon a cylinder I and a cylinder I', each cylinder having a chamber i , closed by a head or cap i' , screw-threaded into the end of the cylinder, and leading from each chamber i through the plate or wall c^6 is a port or passage i^2 , coinciding with a passage i^3 in the walls of the chest, which passages are so arranged as to cut the adjacent passages c' and c^2 to form a discharge-port i^4 for each passage c' and c^2 , leading from the passage into the passage i^3 for venting pressure alternately from the passages c' and c^2 , the vent-passages being opened and closed simultaneously with the closing and opening of the pressure-supply passages by the lever h . Each cylinder I and I' has therein a mov-

able stem J, slidably mounted within the cap i' and of a diameter to allow of the escape of pressure around the stem and through the port in the cap, and on each of the stems is a disk or collar adapted to be brought into contact with the inner end of the port in the cap to close the same and prevent the education of pressure from the chamber. The two caps are normally held into contact with their respective ports by means of coil-springs j' , one in each of the cylinders, and the stems are adapted to project upwardly above the caps of the cylinders, so that under normal conditions the spring of each stem acting upon the disk of collar closes the port and forces the stem above the top of the cap. As shown in Fig. 3, the stem J of the cylinder I' is being forced down by the arm h^2 , which unseats the disk and opens the valve in the cylinder I' to vent pressure therethrough, the valve in the cylinder I remaining seated. As the lever H is rocked it will alternately contact the upwardly-projecting stems in the two cylinders to vent pressure from that cylinder whose stem is contacted.

Pressure is admitted to the chamber of the chest C by a pipe (not shown) leading from a suitable source of compressed air or other fluid-pressure, which pipe can be attached to a nipple k by a coupling k' or otherwise, so as to allow the pressure to flow into the chamber of the chest and pass from the chamber alternately to opposite ends of the motor-cylinder and act against the piston of said cylinder and cause the piston to reciprocate within the chamber of the motor-cylinder.

The operation is as follows: With the controlling-valve and its appliances, as in Fig. 2, and the piston b at the limit of its downward stroke the valve D is in position for the pressure to flow from the chamber of the chest through the passage c' , passage c^3 , and passage a' back of the cylinder to act and move the cylinder in the direction of the opposite end of the chamber. The initial movement of the piston toward the opposite end of the chamber of the cylinder from that shown in Fig. 2 causes the upward movement of the piston-rod B to carry with it the rod G, and with such movement the valve D remains in the position shown in Fig. 2 until the tappet g strikes the arm f , whereby the continued upward movement of the rod G moves the lever F in an upward direction, rocking the shaft or rod E and moving the arm e in the direction to withdraw the controlling-valve D from the position shown in Fig. 2, so that the end face thereof closing the passage c^2 will be carried away from its seat, and the opposite end of the valve will be carried to its seat, opening the passage c^2 and closing the passage c' , thus allowing the pressure to flow through the opened passage c^2 and force up the piston d^2 , thereby opening the passages c^3 and a^2 into the end of the cylinder-chamber to drive down the piston to its initial position, and with the admission of pres-

sure through the passage a^2 the passage a' is open for the eduction of pressure from in front of the piston as it travels toward the end of the cylinder-chamber, and with the parts as in Fig. 2 the passage a^2 is open for the eduction of the pressure back of the piston as it travels toward the opposite end of the cylinder-chamber. The piston d^2 of the rod D' is withdrawn, so as to open the passages a^2 and c^3 for the pressure to flow through the passage c^2 to the atmosphere, and this piston will remain in the position shown in Fig. 2 until the controlling-valve D is shifted by the engagement of the tappet g with the arm f . The shifting of the controlling-valve to open the passage c^2 , which is closed in Fig. 2, will cause the pressure to enter and act on the piston d^2 and move the same beyond the passage c^3 in communication with the passage a^2 and move the piston d' to pass the passage c^3 , opening communication between the chamber c and the motor-cylinder chamber at the passage a^2 and permitting pressure to discharge from the motor-cylinder chamber through the passage a' into the passage c' and out to the atmosphere. The admission of pressure at the passage a^2 moves the piston b from the opposite end of the chamber of the motor-cylinder to the end of the chamber in which the piston stands in Fig. 2, and such travel of the piston b will continue until the tappet g engages with the arm f' of a lever F and moves the lever F in the direction of the travel of the piston-rod B and the rod G , rocking the shaft E and through the arm e moving the valve D on the rod D' to the position shown in Fig. 2, closing the passage c^2 against the admission of pressure and opening the passage c' for the admission of pressure, and with the admission of pressure into the passage c' the pressure acts on the piston d' and moves the rod D' for the piston d' to open the passage a' for the induction of pressure and to open the passage a^2 for the eduction of pressure, and these movements of the valve D and the rod D' with its pistons d' and d^2 alternately induct and educt pressure into and from the cylinder of the motor for the pressure to act on opposite sides of the piston b and reciprocate the piston-rod. The movement of the lever F to close the passage c^2 and open the passage c' causes the end f^2 of the lever to engage the pin h^3 and rock the lever H on its pivot for the arm h^2 to engage the end of the stem J , forcing the disk j from contact with the end face of the plug i' and opening the chamber i for pressure to flow from the passage c^3 through the port i^4 , passage i^3 , and port i^2 into the chamber i and escape therefrom around the stem J . The movement of the lever F in the opposite direction causes the arm or neck f^2 of the lever to engage the arm h^3 of the lever H and carry down the arm h' , engaging the valve-stem J , that coacts with the arm h' to open the chamber i of the cylinder I , venting the pressure from the passage c' through the port i^4 , passage i^3 ,

and port i^2 into the chamber of the cylinder I to escape around the stem, relieving the passage c' from back pressure. It will thus be seen that with the movement of the sliding rod D' to open the passage c' for inducting pressure the pressure back of the piston d^2 in the passage c^2 is vented through the chamber i of the cylinder I' , and with the movement of the sliding rod D' to open the passage c' for inducting pressure into the motor-cylinder the pressure in the passage c' is vented through the chamber of the cylinder I' , thus relieving the pressure in the passages c' and c^2 back of the pistons d' and d^2 , respectively, the respective vent-valves being opened simultaneously with the closing of the respective pressure-supply passages with which they coact, and vice versa.

The controlling-valve D is actuated from the traverse of the piston in the motor-cylinder, and the valves controlling the eduction of pressure back of the pistons d' and d^2 are likewise actuated from the reciprocation of the piston-rod, thus making the operation of all the valves dependent on the movements of the power-piston, so that the operation of both the controlling-valve and the eduction-valves will be positive and occur at the proper time in relation to the strokes of the power-piston.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a fluid-pressure motor, the combination of a power-cylinder having at each end thereof a passage for inducting and educting pressure, a piston within the cylinder having a piston-rod connected therewith, a valve-chest receiving fluid-pressure therein and having on opposite sides a passage leading therefrom and in communication with the passage of the cylinder for inducting and educting pressure, a shiftable valve in the chest, a slidable rod on which the shiftable valve moves, a piston on each end of the slidable rod controlling the communication between the passage from the valve-chest and the pressure inducting and educting passage of the cylinder, and means for changing the position of the shiftable valve from the movements of the piston-rod to induct and educt pressure alternately at opposite ends of the power-cylinder, substantially as described.

2. In a fluid-pressure motor, the combination of a power-cylinder having at each end thereof a passage for inducting and educting pressure, a piston within the cylinder having a piston-rod connected therewith, a valve-chest receiving fluid-pressure therein and having on opposite sides a passage leading therefrom and in communication with the passage of the cylinder for inducting and educting pressure, a shiftable valve in the chest, a slidable rod on which the shiftable valve moves, a piston on each end of the slidable rod controlling the communication between the passage from the valve-chest and the pressure inducting and educting passage

- of the cylinder, a rock-shaft or rod in the valve-chest, an arm on the rock-shaft or rod engaging the shiftable valve, a lever connected with the rock-shaft or rod, and means for vibrating or oscillating the lever from the movements of the piston-rod to shift the position of the valve and induct and educt pressure alternately at opposite ends of the power-cylinder, substantially as described.
3. In a fluid-pressure motor, the combination of a power-cylinder having at each end thereof a passage for inducting and educting pressure, a piston within the cylinder having a piston-rod connected therewith, a valve-chest receiving fluid-pressure therein and having on opposite sides a passage leading therefrom and in communication with the passage of the cylinder for inducting and educting pressure, a shiftable valve in the chest, a slidable rod on which the shiftable valve moves, a piston on each end of the slidable rod controlling the communication between the passage from the valve-chest and the pressure inducting and educting passage of the cylinder, a rock-shaft or rod in the valve-chest, an arm on the rock-shaft or rod engaging the shiftable valve, a lever connected with the rock-shaft or rod, a rod connected with the piston-rod of the power-cylinder, and a tappet on the rod engaging with the lever for rocking the shaft or rod in the valve-chest and shifting the position of the valve for inducting and educting pressure alternately at opposite ends of the power-cylinder, substantially as described.
4. In a fluid-pressure motor in combination with a power-cylinder and pressure-induction ports leading thereto, a valve controlling the induction of fluid-pressure through the ports to the power-cylinder consisting of a slidable member mounted upon a movable rod, two fixed pistons one on each end of the rod, said pistons controlling the induction of pressure through the ports, and means for moving the slidable member upon the rod to admit pressure to act alternately upon the pistons to move the same and alternately open and close the ports to admit pressure to the power-cylinder, substantially as described.
5. In a fluid-pressure motor, in combination with a power-cylinder and induction-ports leading thereto, a chest for receiving pressure and having communication through the ports with the power-cylinder, a controlling-valve in the chest consisting of a slidable member mounted upon a slidable rod, fixed pistons on the ends of the rod controlling the induction of pressure to the cylinder, and means for moving the slidable member of the valve upon the rod to admit pressure to act alternately upon the fixed pistons to alternately open and close the ports leading to the power-cylinder, substantially as described.
6. In a fluid-pressure motor, the combination of a valve-chest receiving pressure there-

into, a slidable valve controlling the induction of pressure from the chest, a slidable rod on which the valve is movable, and two pistons on the rod adapted to be alternately moved by the pressure admitted by the valve to control the induction of pressure from the chest to a power-cylinder and the eduction of pressure from the power-cylinder to the atmosphere, substantially as described.

7. In a fluid-pressure motor, the combination of a chest receiving pressure therein and having inducting-passages for a power-cylinder leading therefrom, a shiftable rod operating in the chest and the induction-passages, and having pistons thereon actuated alternately by the admitted pressure controlling the induction and eduction of pressure from the power-cylinder, and a valve for each inducting-passage opening for the eduction of pressure on the return stroke of the rod in either direction, substantially as described.

8. In a fluid-pressure motor, the combination of a chest receiving pressure therein, a valve controlling the induction of pressure from the chest to a power-cylinder, a slidable rod having pistons actuated alternately by the pressure admitted to the valve for controlling the induction-passages from the chest, an oscillating lever for moving the controlling-valve, an eduction-valve from each induction-passage of the chest opened to vent pressure on the return stroke of the rod in either direction, a rocking lever for operating the eduction-valve and moved from the oscillating or vibrating movements of the lever of the controlling-valve, and means for actuating the oscillating or vibrating lever with the strokes of the piston in the power-cylinder, substantially as described.

9. In a fluid-pressure motor, the combination of a chest receiving pressure therein, a valve controlling the outflow of pressure from the chest on opposite sides thereof, a valve controlling the eduction of pressure when the valve controlling the outflow is closed on one side, an oscillating or vibrating lever for moving the controlling-valve for the outflow and the valves for the eduction, and means for oscillating or vibrating the lever with the strokes of the power-piston, substantially as described.

10. In a fluid-pressure motor, the combination of a chest receiving pressure therein, a valve controlling the outflow of pressure from the chest on opposite sides thereof, a slidable rod having a piston at each end thereof, an eduction-passage between the piston on the rod and the seat of the controlling-valve, and a valve controlling the eduction-passage, substantially as described.

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