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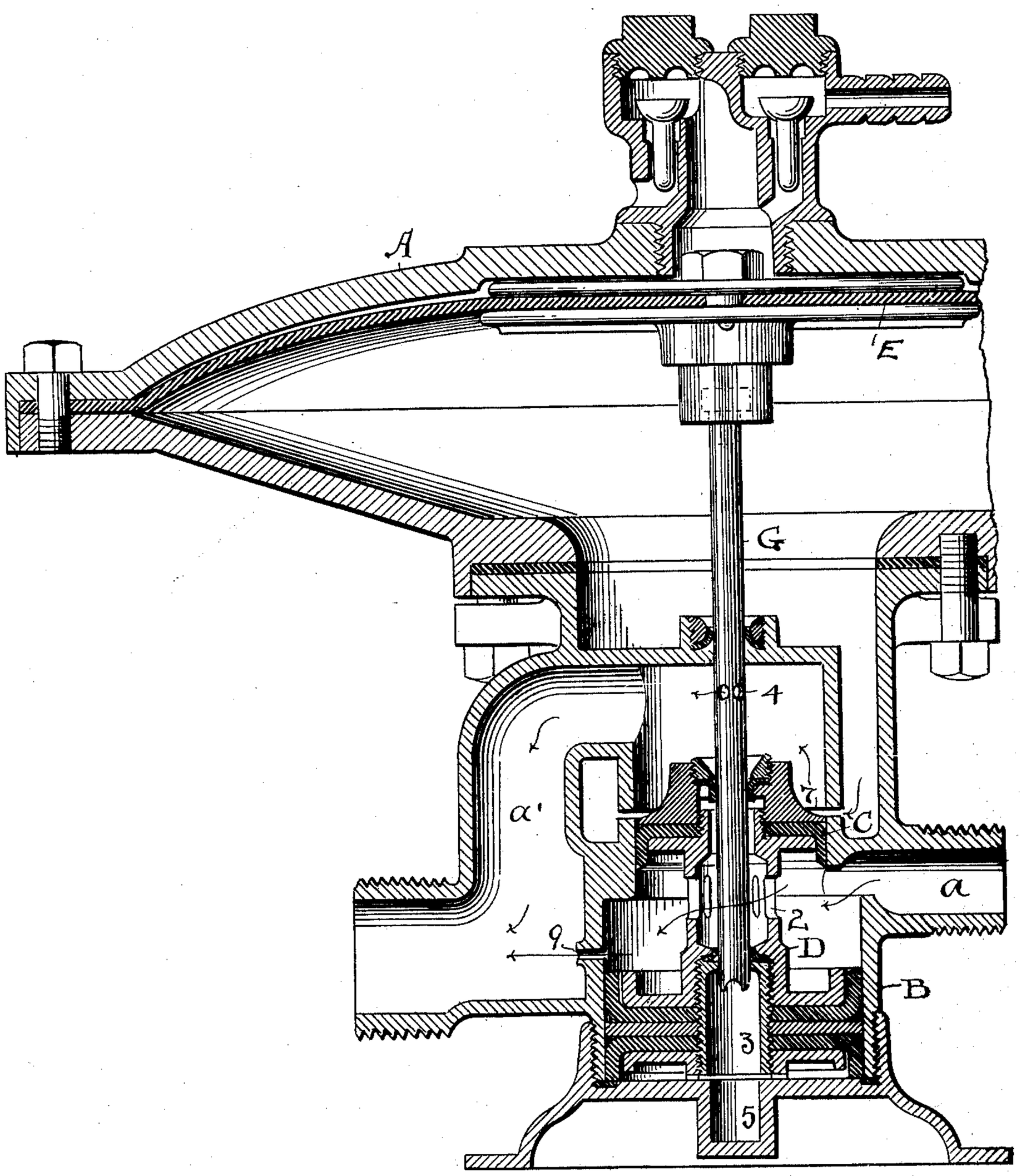
E. H. WEATHERHEAD.

VALVE MECHANISM FOR HYDRAULIC MOTORS.

APPLICATION FILED FEB. 13, 1902.

NO MODEL.



Attest
R. B. Moser
T. M. Madden.

Inventor
Edward H. Weatherhead
By W. T. Fisher Atty

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UNITED STATES PATENT OFFICE.

EDWARD H. WEATHERHEAD, OF CLEVELAND, OHIO.

VALVE MECHANISM FOR HYDRAULIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 737,685, dated September 1, 1903.

Application filed February 13, 1902. Serial No. 93,897. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. WEATHERHEAD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Valve Mechanism for Hydraulic Motors; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hydraulic pumps of the kind in which water under pressure is used as the source and means of power and by which various kinds of work may be done—such as compressing air, lifting water to higher levels, and the like.

The special object of this invention is to improve the construction of this particular style of pump so as to materially facilitate the discharge of the dead water from the pump after each distinct operation, as well as to simplify the construction so that the operation of the pump may be more direct, its construction cheapened, and the number of parts reduced, all as hereinafter fully described, and particularly pointed out in the claims.

In the drawing the single figure shows the parts as when one operation has been completed and the parts are in position for a discharge of the water from the pump.

A represents the entire outer casing of the pump structure as here shown, which may be made up of as many parts or portions as convenience or economy in manufacture may suggest, and in so far as the general outline of these parts is concerned they are not deemed especially new in this case, being in a large measure shown in former constructions and patents. However, there are certain modifications and differences in detail here and there, which will appear in the further description of the invention and are of material value.

The operating or movable parts consist of a pair of differential combined valves and pistons or valve-pistons B and C, which are permanently connected by a tubular coupling D, having a series of openings 2 about midway of its length and a limited fluid area or space on its inside, and the diaphragm-piston E, having a valve tube or stem G connected therewith and projecting down through the two valve-pistons into the area or space 3 within and beneath lower valve-piston B. The said valve stem or tube G has a few small openings 4 near the middle of its length and is adapted to be raised and lowered in respect to the two parts B and C by the operations of piston E. In any case, however, the said valve-stem G is in open communication with the space within and beneath the valve-piston B, and when in the lowest position its extremity drops into the well 5 in the bottom of casing A. This lengthwise movement of the said valve-stem likewise changes the position of the holes 4 in respect to valve-piston C and the spaces above and below the same, so that in the first instance the said holes 4 are open within coupling D and exposed through the openings 2 to fluid-pressure through inlet *a*, and when in this position fluid is driven in and down through the said valve-stem into the spaces beneath valve-piston B and the said part is forced upward.

It will of course be understood that in a measure the opposite valve-pistons B and C counterbalance each other, but the greater area of B is such that the said parts at last are driven upward together from their lowest position to their highest position when the pressure enters beneath the part B. Being thus raised while the diaphragm-piston E and rod G are down, the valve-piston C uncovers the fluid-passage 7 in the inner portion of casing A and enables the fluid to flow in beneath the said piston E and raise the same up, and at the same time and in the same measure raise the valve-tube G. Valve-pistons B and C hold the raised positions while the said parts E and G are moving upward until they reach their highest point. Then the valve-tube has been raised high enough to bring the openings 4 above valve-piston C, and thereupon there is opened an exhaust-passage for the water beneath valve-piston B through the valve-tube G, as indicated by the arrows in the drawing, and the greater pressure upon valve-piston B as compared with valve-piston C again asserts itself and the parts B and C are carried down, exhausting the water beneath B through the valve-tube. When thus carried down, the fluid-opening 7, which is controlled in all cases by valve-piston C, is

exposed above the part C and affords a free exhaust-passage for the water from the diaphragm-piston chamber, while at the same time the pressure-water is cut off as to the passage 7. Now there is a gravity-discharge from beneath the diaphragm-piston through passage 7 and out above valve-piston C through the exhaust-pipe or outlet-port a'.

In the main the foregoing construction and operation of parts is disclosed in the constructions that are now acknowledged to be old; but there has always been more or less difficulty and objection encountered in the operation in this style of pump because of the slowness of discharge when mere gravity is depended upon and there are no artificial means to stimulate the outflow of the dead fluid. In some former constructions I have sought to overcome this objection by providing a fluid-ejector nozzle in the upper portion of the outlet-passage from the diaphragm-chamber; but for sundry reasons this construction has not proven the best, and hence the development of the present pump, in which an ejector orifice or passage 9 is formed in the interior base portion of the pump-casing directly in line with the center of exhaust-port a' and practically in line with the pressure-inlet port a and controlled only by valve-piston B. By this improvement it occurs that when the piston-valve B is down and the said orifice is uncovered there is at once set up a powerful draft through the exhaust-passage a', which causes not only a directly-accelerated flow of the water out through said passage, but produces a suction or pull upon the otherwise comparatively lazy descent of the water from the diaphragm-chamber, with the result that the water is exhausted therefrom in very materially less time than would be possible if there were no forced ejection employed. It will be noticed also as a feature of this construction that it requires absolutely no new part whatever to provide ejection, because the valve-piston B is needed in any event, and the only additional thing required is to form the ejector-orifice 9 and the work is done. This, too, with greatly improved results over anything that I have heretofore employed or known.

I have shown and described this invention in connection with a diaphragm-piston. It does not necessarily follow that it must be a diaphragm-piston, but any properly constructed piston and casing therefor may be employed and be within the spirit of my invention, because it is not material whether it be this or some other form of piston, provided there be the other constructions and parts to make said piston effective in work.

I refer to parts B and C as valve-pistons or combined valves and pistons because both parts perform the functions of valves and pistons, as seen, the part B being a valve for orifice 9 and part C a valve for passage 7, while the fluid-pressure bears upon them and actuates them as pistons.

What I claim is—

1. In a hydraulic pump of the kind described, the casing provided with separate inlet and exhaust ports and a set of connected valve-pistons, the said casing having a separate ejector-orifice directly open to the main water-pressure, and located in the path of the lower of said valve-pistons adjacent the exhaust-port and open thereto, whereby said lower piston opens and closes said ejector-orifice, substantially as described.

2. In hydraulic pumps, a casing provided with an internal chamber having an inlet-port and an exhaust-passage, and a separate ejector-orifice in line with the exhaust-port from said casing, in combination with a pair of differential valve-pistons arranged to traverse said exhaust-passage and said ejector-orifice, respectively, and to open and close the same alternately, substantially as described.

Witness my hand to the foregoing specification this 23d day of December, 1901.

EDWARD H. WEATHERHEAD.

Witnesses:

R. B. MOSER,

TERESSA M. MADDEN.