(No Model.) 3 Sheets—Sheet 1.

C. A. JONES.

VALVE FOR HYDRAULIC OR STEAM MACHINERY.

No. 501,791. Patented July 18, 1893.

FIG 1

FIG 2

WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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FIG 3

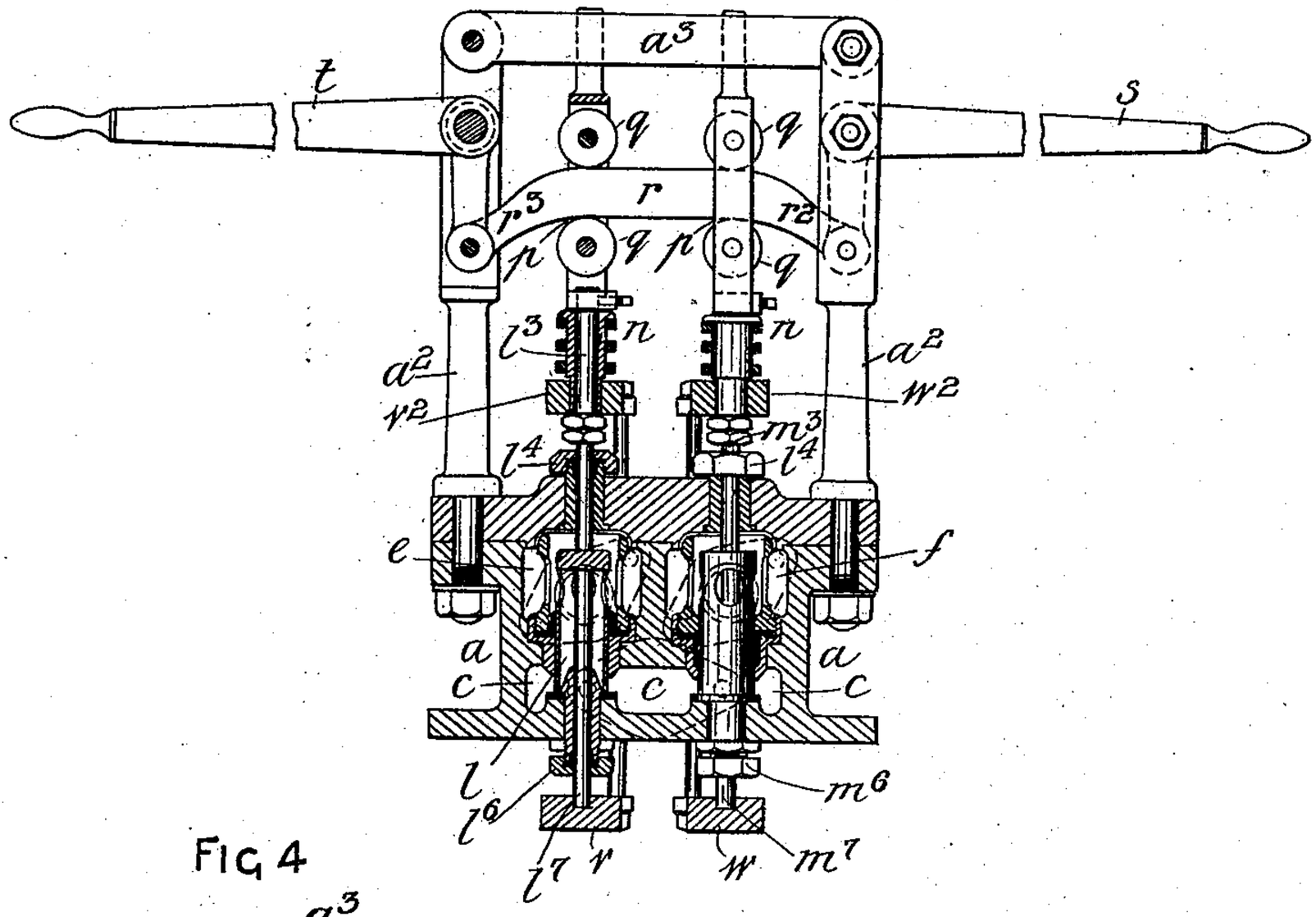


FIG 4

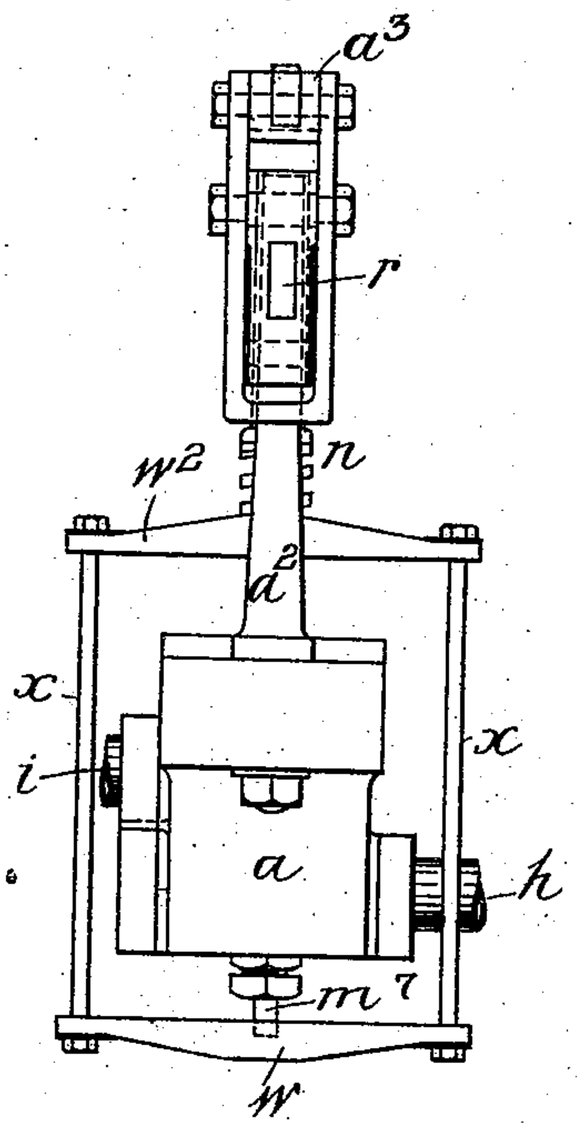
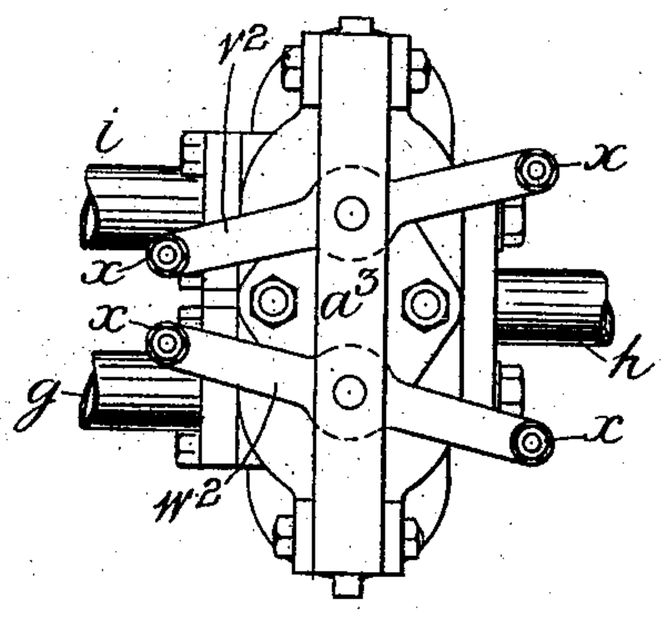


FIG 5



WITNESSES

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(No Model.) 3 Sheets—Sheet 3.

C. A. JONES.

VALVE FOR HYDRAULIC OR STEAM MACHINERY.

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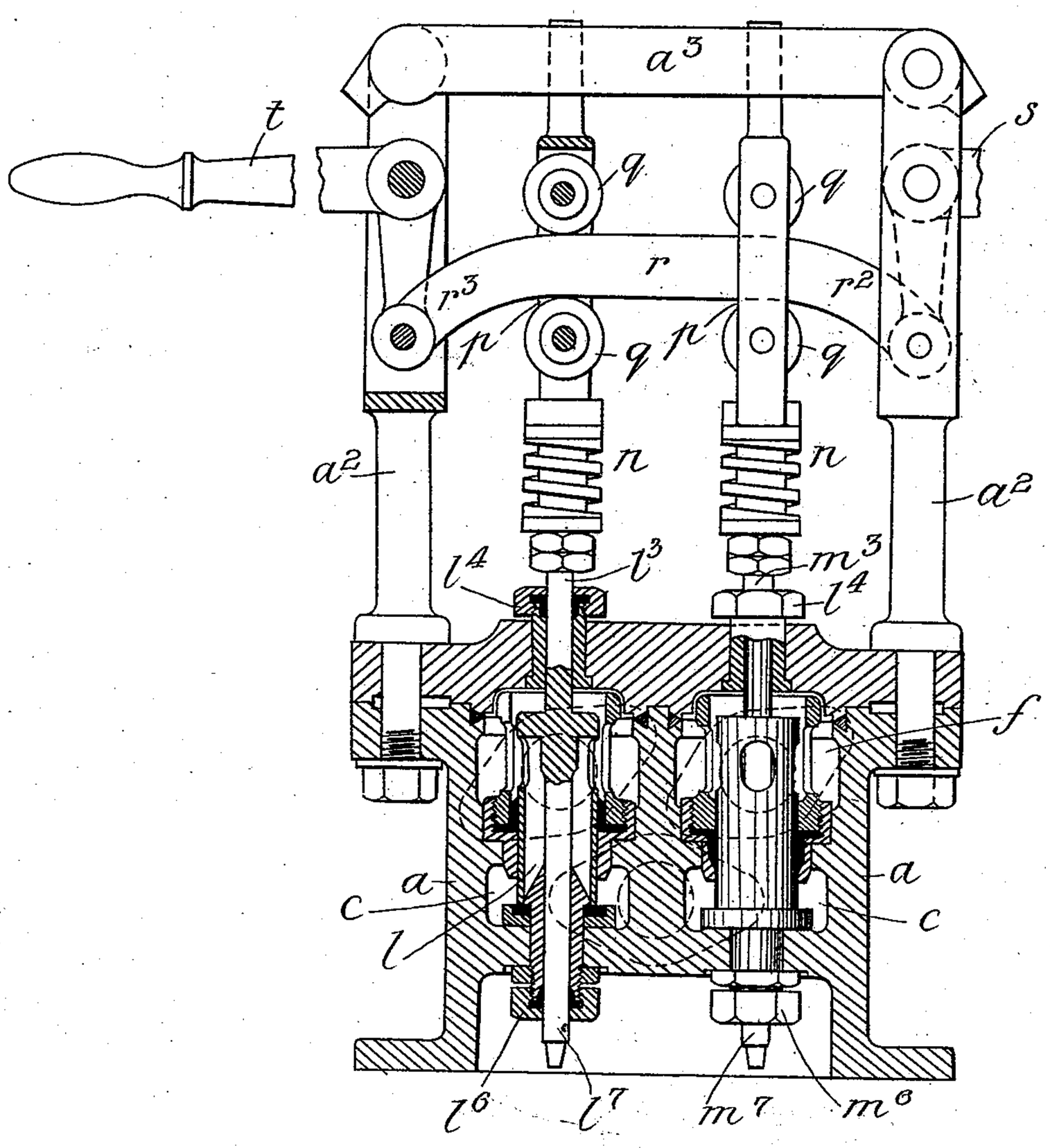
FIG 6



WITNESSES

Charles Bosworth Kelley

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INVENTOR

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UNITED STATES PATENT OFFICE.

CHARLES ARTHUR JONES, OF SMETHWICK, ENGLAND.

VALVE FOR HYDRAULIC OR STEAM MACHINERY.

SPECIFICATION forming part of Letters Patent No. 501,791, dated July 18, 1893.

Application filed October 11, 1892. Serial No. 448,535. (No model.) Patented in England October 12, 1889, No. 16,117.

To all whom it may concern:

Be it known that I, CHARLES ARTHUR JONES, a subject of Her Majesty the Queen of Great Britain and Ireland, residing at Raglan Road, Smethwick, in the county of Stafford, England, have invented certain new and useful Improvements in Valves for Hydraulic and Steam Machinery, (for which I have obtained Letters Patent in England, dated October 12, 1889, No. 16,117,) of which the following is a specification.

The said invention relates principally to valves for opening and closing or partially opening and closing the communication between a hydraulic accumulator or other source of water under pressure and the machinery actuated by the said water under pressure and also opening and closing communication with the exhaust or waste water pipe. The said invention is however applicable to valves for hydraulic purposes generally and to valves for steam engines and hoists and presses of various kinds.

Valves made according to the said invention are manipulated easily and quickly and without the concussion frequently attendant on the working of hydraulic valves.

I will describe the said invention in connection with a hydraulic accumulator and lift or hoist, and I will refer to the accompanying drawings on which—

Figure 1 represents in front elevation partly in vertical section and Fig. 2 in end elevation a hydraulic valve constructed according to the said invention to be used in connection with a hydraulic accumulator and the lift or hoist to be worked by the water or other liquid under pressure contained in the said accumulator or for other like purposes. Fig. 3 is a sectional elevation. Fig. 4 is an end elevation and Fig. 5 is a plan of a modification of the said valve and Fig. 6 is a sectional elevation of a further modification of the same.

The same letters of reference indicate the same or corresponding parts in all the figures.

Referring first more particularly to Figs. 1 and 2 a is a strong metallic chamber constituting the base of the valve to which are bolted the uprights a^2 a^2 carrying the actuating mechanism of the valve and the guide bar a^3. The said strong metallic chamber a is divided by the horizontal diaphragm b into two compartments the lower compartment being marked c. The upper compartment is divided by the vertical diaphragm d into two compartments marked respectively e and f.

g is the ingress pipe from the hydraulic accumulator opening into the upper compartment e and h is the egress pipe in communication with the lift or hoist opening into the lower compartment c.

i is the waste pipe opening into the upper compartment f.

Working through stuffing boxes k, k placed in holes in the horizontal diaphragm b are two hollow pistons or valves l m the work piston being marked l and the waste piston m. It will be seen by an examination of Fig. 1 that the upper part of each of the hollow pistons l m works in its own upper compartment e or f and that the lower part of each hollow piston works in the lower compartment c common to both. The said pistons l and m are closed at top and open at bottom their open bottoms being capable of being seated upon and raised from the convex seats l^2 m^2 on the bottom of the lower compartment as represented in Fig. 1.

In place of the convex seats l^2 m^2 the open bottoms of the pistons l m may seat themselves upon seats of leather, india rubber or other like material as shown for instance in Figs. 3 and 6. The upper part of each hollow piston has side openings as represented, the water or other liquid from the upper compartment e passing through the said openings into the hollow piston l and water from the lower compartment c passing up the hollow piston m and out by its side openings into the other upper compartment f.

l^3 is the piston rod of the hollow piston l and m^3 is the piston rod of the hollow piston m the said piston rods l^3 m^3 passing through stuffing boxes at l^4 m^4 and being guided by the cross guide bar a^3.

It will be seen by an examination of Fig. 1 that the piston rods or stalks l^3 m^3 are made in two parts the end of one part being capable of a slight sliding motion in the end of the other part, the two parts being connected together by the strong coiled spring n. By this arrangement a limited elasticity is given

to the piston rods or stalks which prevents injury to the pistons should any solid particles lodge on the seats of the said pistons. The tops of the piston rods are loaded with the weights l^5 m^5.

As the water or other liquid under pressure acts upon both the exterior and interior of the hollow pistons l m the said pistons are balanced excepting with respect to an area equal to the sectional area of the stems or stalks. To complete the balancing the loads l^5 m^5 at the tops of the said stems or stalks are employed.

The action of the hollow pistons or piston valves l m is as follows:—When the two pistons l m are in the depressed positions represented in Fig. 1 and their open bottoms are seated on the seats l^2 m^2 the communication between the ingress pipe g from the accumulator in the compartment e and the egress pipe h to the lift or hoist in the lower compartment c is cut off. When the work piston l is raised from its seat l^2 the waste piston m being kept to its seat, water from the hydraulic accumulator passes by the ingress pipe g into the upper compartment e of the said work piston and through the openings near its top down the hollow piston into the lower compartment c and from thence through the egress pipe h to the hoist. The hoist having been lifted to the required height the work piston l is depressed on to its seat and the flow of water is cut off and the hoist is supported in the position to which it has been raised. For the purpose of lowering the hoist the waste piston m is raised (the work piston l being kept in its lowered position) when the water from the hoist returns by the egress pipe h into the lower compartment c passes up the interior of the waste piston m through the openings near its top into the upper compartment f and passes out by the waste pipe i opening into the said compartment f.

I will now describe the mechanism for operating the two pistons l m. The upper part of each of the stems or stalks l^3 m^3 is slotted at p and at the top and bottom of each slot is an anti-friction roller q. Through these slots p p and between the pairs of anti-friction rollers q q the cam bar r r^2 r^3 passes and works the motion of the said cam bar in one or other direction raising or lowering one of the pistons and holding down the other piston as hereinafter described. The said cam bar has the form represented, that is, its middle r is straight and its ends r^2 r^3 curve downward. Jointed to each of the uprights a^2 a^2 of the fixed frame is a cranked hand lever marked respectively s and t the short arms of the said levers being jointed to the ends of the cam bar r r^2 r^3. Either lever s or t may be used for operating the valve. It will be seen that when the pistons l m are in their lowered positions the long arms of the hand levers s t are horizontal and the short arms jointed to the cam bar are vertical. When the long or working arm of either hand lever is raised or lowered the cam bar r r^2 r^3 is made to slide in the stalks or stems l^3 m^3 of the pistons the said cam bar rising or falling with a parallel motion. When the cam bar is in its lowered position as represented in Fig. 1 the valve is out of action and in order to first operate the hoist, next cut off the water supply thereto, and afterward lower the hoist, the cam bar is worked in the following manner.

I will describe the working of the valve by the use of the hand lever s on the right hand side of the apparatus. By depressing the long arm of the said hand lever s the cam bar r r^2 r^3 is moved in the direction of the arrow on the said bar and its straight part r advanced in the slot of the stalk l^3 of the work piston l the said cam bar taking the position indicated in dotted lines. The work piston l is thereby raised from its seat and the water from the accumulator put into communication with the hoist as before described the waste piston m being by the same motion of the cam bar held down by the advance of its curved end r^2 into the slot p of the stalk m^3 of the said waste piston m. The hoist having been raised to the required height the hand lever s is returned to the position represented in the drawings thereby lowering the work piston l to its seat and cutting off communication between the ingress and egress pipes g and h.

In order to lower the hoist the hand lever s is lifted. The straight part r of the cam bar now advances in the slot p of the stalk m^3 of the waste piston m lifting that piston and the curved end r^3 of the cam bar advancing in the slot of the stalk l^3 of the work piston holds down that piston. Communication is thus established between the egress pipe h and the waste pipe i and the water from the hoist escapes by the said pipes as before described.

By means of a connecting rod u the working lever s or t may be so connected with the hoist that when the latter is raised to its highest position the said working lever is so operated upon as to lower the work piston and shut off the water under pressure.

Instead of employing the weights l^5 and m^5 to effect the balance of the hollow pistons the arrangement represented in vertical section partly in elevation in Fig. 3, side elevation in Fig. 4 and plan in Fig. 5 may be employed. In this arrangement the piston rods or stalks l^3 m^3 are prolonged downward in the axes of the hollow pistons l m respectively and pass out of the bottom of the lower chamber c through the stuffing boxes l^6 m^6. The lower ends l^7 m^7 of the said prolonged rods or stalks bear respectively on the cross bars v w carried by the upper cross bars v^2 w^2 the said cross bars v v^2 and w w^2 being connected by the vertical connecting rods x x. Or as shown in Fig. 6 the cross bars v w and v^2 w^2 may be dispensed with and the piston rods or stalks l^3 m^3 may be connected directly with their lower ends l^7 and m^7 respectively; in which

case the said rods are secured to the valves *l* and *m* through the tops of which they pass. By this arrangement the balance of the parts is always preserved whatever be the pressure of the water employed.

The parts of the valve Figs. 3, 4 and 5 and Fig. 6 which I have not described are constructed and used as hereinbefore described with reference to Figs. 1 and 2 and corresponding parts are marked with the same letters of reference.

Although I have represented in Figs. 1 and 2 convex valve seats and in Figs. 3, 4, 5 and 6 conical valve seats yet flat valve seats may be employed for piston valves to seat themselves upon.

I have only represented and described the use of two hollow piston valves but I wish it to be understood that the piston valves can be used singly as well as in pairs in various kinds of hydraulic and steam machinery. When a single piston valve is used it is operated directly by means of a lever instead of by the cam bar and its appendages described and represented.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a valve of the character described, the combination with a water-tight chamber divided into three compartments, and a duct communicating with each of the said compartments, of hollow cylindrical valves to open or cut off communication between the said compartments, valve rods formed of two pieces, the lower pieces passing through the hollow cylindrical valves and through the upper and lower walls of the chamber, to balance the said valves; spring cushions connecting the upper and lower pieces of the valve rods together, and means for reciprocating the said valve rods to open or cut off communication between the compartments in the chamber, substantially as and for the purposes described.

2. In a valve of the character described, the combination with a water-tight chamber divided into three compartments, and a duct communicating with each of the said compartments, of hollow cylindrical valves to open or cut off communication between the said compartments, valve rods formed of two pieces, the lower pieces secured to the hollow cylindrical valves, and passing through guides in the frame and the upper pieces having slots in which are journaled rollers, a horizontal cam bar curved downwardly at its ends and passing between the said rollers, bell-crank levers pivoted in the frame from which the said horizontal cam bar is suspended at its ends, so that by motion of one of said bell-crank levers the horizontal piece may be moved to the right or left and at the same time upwardly or downwardly, to raise or lower either of the hollow cylindrical valves, substantially as and for the purposes described.

3. In a valve of the character described, the combination with a water-tight chamber divided into three compartments, and a duct communicating with each of the said compartments, of hollow cylindrical valves to open or cut off communication between the said compartments, valve rods formed of two pieces, the lower pieces secured to the hollow cylindrical valves, and passing through guides in the frame and the upper pieces having slots in which are journaled rollers; spring cushions by which the two pieces of the valve rods are connected together; a horizontal cam bar curved downwardly at its ends and passing between the said rollers, bell crank levers pivoted in the frame from which the said horizontal cam bar is suspended at its ends, so that by motion of one of said bell-crank levers the horizontal piece may be moved to the right or left and at the same time upwardly or downwardly, to raise or lower either of the hollow cylindrical valves, substantially as and for the purposes described.

4. In a valve of the character described, the combination with a water-tight chamber divided into three compartments, and a duct communicating with each of the said compartments, of hollow cylindrical valves to open or cut off communication between the said compartments, valve rods formed of two pieces, the lower pieces secured to the hollow cylindrical valves, and passing through guides in the frame and the upper pieces having slots in which are journaled rollers, spring cushions by which the two pieces of the valve rods are connected together, weights secured to the upper ends of the upper pieces of the valve rods to assist in balancing the valves, a horizontal cam bar curved downwardly at its ends and passing between the said rollers, bell-crank levers pivoted in the frame from which the said horizontal cam bar is suspended at its ends, so that by motion of one of said bell-crank levers the horizontal piece may be moved to the right or left and at the same time upwardly or downwardly, to raise or lower either of the hollow cylindrical valves, substantially as and for the purposes described.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

CHARLES ARTHUR JONES.

Witnesses:

CHARLES BOSWORTH KETLEY,

HERBERT WHITEHOUSE.