

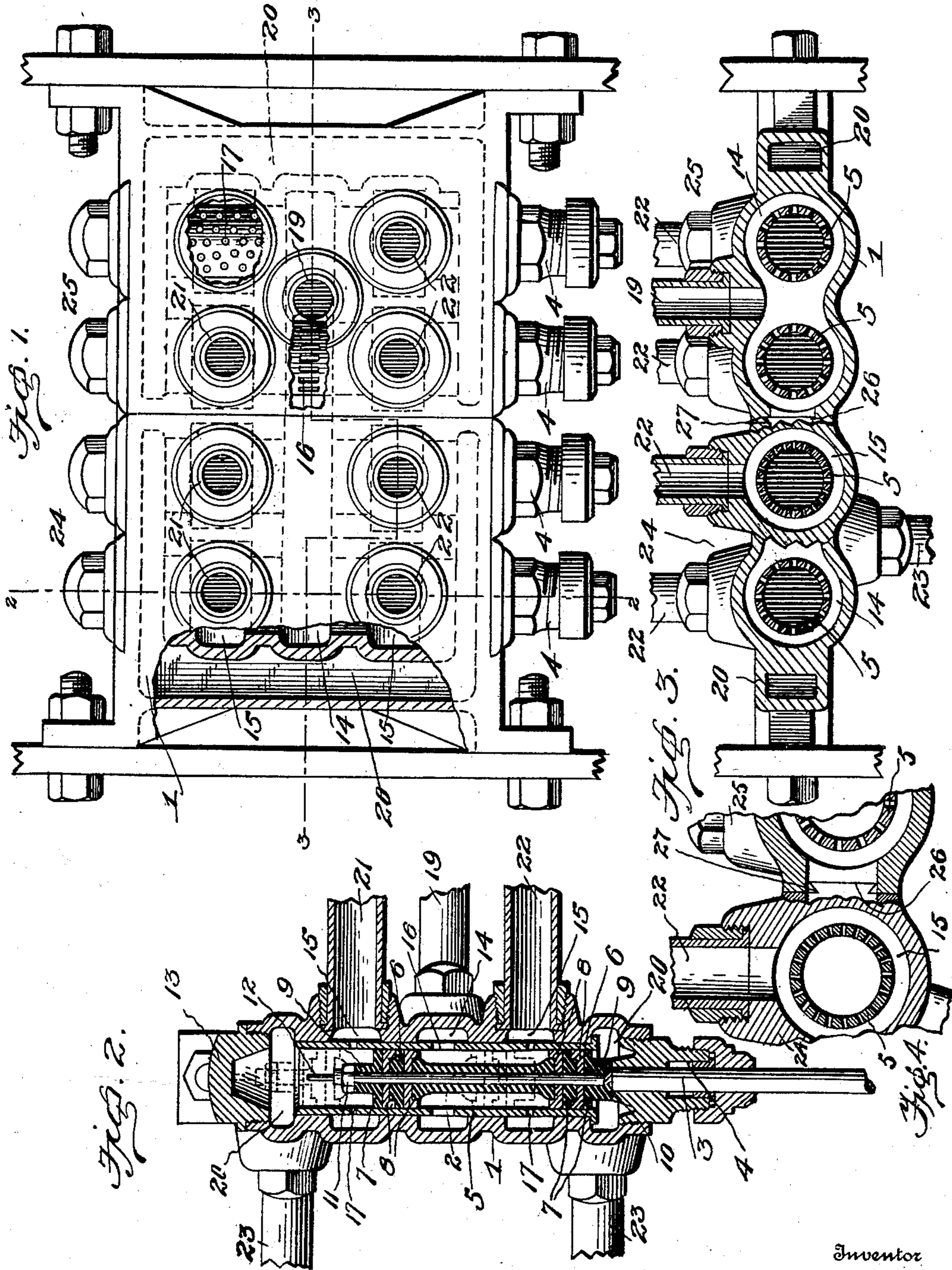
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E. E. E. MEARS.  
HYDRAULIC VALVE MECHANISM.

(Application filed Mar. 21, 1901.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 679,767, dated August 6, 1901.

Application filed March 21, 1901. Serial No. 52,178. (No model.)

*To all whom it may concern:*

Be it known that I, ELMER E. E. MEARS, a citizen of the United States, residing at Munhall, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Hydraulic Valve Mechanisms; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to hydraulic valve mechanism for hydraulic cranes and other hydraulic machinery, and is designed as an improvement upon the hydraulic valve mechanism shown in Letters Patent No. 412,851, for a hydraulic crane, granted to J. Kennedy and H. Aiken October 15, 1889.

The objects of the present invention are to obviate certain objections hereinafter specified incident to the use of the aforesaid patented valve mechanism, to render the valve mechanism more certain, safe, and efficient in operation and easier of manipulation, and to provide a valve mechanism which may be easily repaired and in which the number of valves employed may be readily varied at will.

With these and other objects in view, which will appear as the nature of the invention is better understood, the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is an elevation, with parts in section, of hydraulic valve mechanism embodying my invention; and Figs. 2 and 3 are respectively sections of the same on the lines 2-2 and 3-3 of Fig. 1. Fig. 4 is a detail view showing the dovetail connection between the casing-sections.

The novel features of my invention and the operation thereof will be readily understood from the following description, taken in connection with the aforesaid patent, to which reference is to be had for a full disclosure of the operating parts and water supply and discharge connections in the application of the invention to a hydraulic crane, although it is to be understood that the valve mechanism may be used in connection with hydraulic

machinery of all kinds requiring the use of valve mechanism of this character.

Referring now more particularly to the drawings, the numeral 1 designates the valve-casing, and 2 the valves. Each valve 2 has a stem 3, which passes through a gland or stuffing-box 4 at the lower end of the valve-case 1. It works in a bushing tube or cylinder 5 and is provided with two heads or pistons 6, one at each end of the cylinder, each of which heads is composed of a pair of flexible disks 7, bearing against the sides of the cylinder, and a pair of metallic disks 8, arranged alternately with said flexible disks 7 and serving as rigid supports therefor. The outermost flexible disk of each piston-head is provided with a reduced sleeve 9, of less diameter than the head, which fills the bushing 5, and the sleeve of the lower head abuts against a rounded shoulder 10 on the stem, while the sleeve of the upper head has bearing thereon a jam-nut 11, threaded on said stem. By constructing the piston-heads in this manner all liability of leakage is avoided, and as each head completely fills the bushing and has no open space for the collection and retention of water a perfect movement of the valve under all conditions of service is insured. The purpose of the reduced sleeves 9 is to allow the valve to move to the full limit of its stroke in both directions without projecting the heads 6 unduly into the water-passage (hereinafter described) and interfering with the free discharge of the waste water. As the sleeves 9 are of less diameter than the heads, the waste water may circulate therearound without liability of retardation. The downward movement of the valve-stem is limited by the sleeve 9 on the lower head abutting against the stuffing-box 4, which prevents the body of said lower head from moving below the lower end of the bushing 5. To limit the upward movement of the valve, the stem 3 has formed upon its upper end a reduced extension 12, which is adapted to abut against a cap 13, closing the upper end of the valve-chamber, and to thereby prevent the body of the upper head 6 from moving beyond the upper end of said bushing 5 and obstructing the flow of the water in the upper portion of the waste-passage. Each valve is designed to be operated by an independent operating-lever, (not shown,)

in substantial accordance with the construction disclosed in the patent to Kennedy and Aiken, above referred to.

The bushing or cylinder 5 is encircled by three passages—one, 14, around the middle and one, 15, near each end. The passage 14 communicates with the valve-cylinder 5 by openings or ports 16 and the annular passages 15 with valve-cylinder by ports or passages 17. The ends of the cylinder 5 open above and below into a passage 20. In my improved construction (shown in the drawings) four of these valves are inclosed in a case or shell 1, in which the passage 14, by which the water is supplied to the valves, communicates with each valve, so that a common supply-pipe 19 serves all the valves. The outside of the communicating passage 14 is shown in Fig. 1, and the manner of communication with the valve is clearly illustrated by the sectional views Figs. 2 and 3. Extending nearly around the four sides of the casing 1 are the waste-water channels 20, which are indicated partly by broken lines in Fig. 1 and partly by full lines at the left side of the figure, where the casing-shell is broken away. The passages 15, of which there are two for each valve, do not communicate with the like passages in the other valves, but are separate and distinct. They communicate with the opposite ends of the particular hydraulic cylinder which is operated by the valve they are connected with by means of the pipes 21 and 22.

The operation of the valves is as follows: The operator moves the proper lever (denoted 47 in the patent referred to) to actuate the valve in the proper direction—say, for instance, downward, as in Fig. 2—and then the water from the supply-pipe 19 passes from the passage 14 through the ports 16 into the valve-cylinder 5 and thence by ports 17, passage 15, and pipe 22 to the end of the cylinder operated thereby, where it acts on the piston in the desired direction. At the same time the downward movement of the valve opens communication between the pipe 21, which leads from the other end of the hydraulic cylinder, by means of the upper passage 15 and ports 17 and the valve-cylinder 5 above the upper valve-head 6, so that the waste water in front of the piston in the hydraulic cylinder can pass freely out into the waste-passage 20 and thence to the waste-pipe 23, connected therewith. A reverse movement of the operating-lever will cause the water to flow in the opposite direction in an obvious manner.

In the construction of valve mechanism shown in the aforesaid patent a waste-water passage extending around all four sides of the casing and common to all the valve-cylinders is employed and is at one point in communication with a discharge-pipe through which the waste water discharges therefrom. This construction is objectionable for the following reasons: It frequently becomes necessary to operate two, three, and in some cases

all four of the valves simultaneously or in quick succession to actuate the various movable parts of the crane. Where two valves are operated simultaneously, no trouble is encountered, as waste water may discharge with more or less freedom through the waste passage and pipe; but when three or all four of the valves are operated the simultaneous discharge of the waste water from the corresponding number of cylinders floods or gorges the waste-passage with a quantity of water beyond its capacity to discharge and frequently renders the apparatus uncontrollable, as the back pressure of the water on the valves moves the valves back and reverses the operating-levers with force, oftentimes sufficient to cause serious injury to the operator and apparatus. In other cases where two or more valves are operated in opposite directions—one up and the other down—the waste water from one will sometimes oppose a resistance to the movement of the waste water from the other, thus necessitating frequent adjustment of the lever to get the valves to do their work. The operator in charge of the crane is when these difficulties are encountered forced to display great activity to gain control of the levers, and before this is accomplished a large amount of damage is often done. In order to obviate this objection, I provide a valve-casing in which two or more separate and independent waste-water passages 20, each having a waste-pipe 23 in communication therewith, are employed, one for each set of valves, which are preferably arranged in pairs. Where an odd number of valves are employed, there will be a discharge-passage for each set or pair of valves and one for the odd valve. As shown in Fig. 1, each passage 20 extends around three sides of the casing 1 on opposite sides of the center of the latter and are not in communication at their inner ends, one of said passages being in communication with the valve-cylinders on one side of the center of the casing 1, while the other passage is in communication with the valve-cylinders on the opposite side of the center of the casing. Each passage is also in communication with a separate waste-pipe 23, one pipe being in communication with the upper portion of one waste-passage and the other pipe in communication with the lower portion of the other waste-passage. By this construction a separate outlet is afforded for the waste water from each pair of valves, and as the construction of the valve-heads 6 is such as to avoid any interference with the flow of the water a ready exhaust of the waste water is insured, thus enabling the valves to be operated with ease, so as to be under the ready control of the operator. By locating the waste-pipes 23 as described, one above and the other below, the flow of water in each waste-passage is equalized, so as to prevent resistance to the inflow of water through the supply-pipe 19, as will be readily understood. Thus it will be seen that my

construction provides a divisional valve-casing having valves arranged in sets in such manner as to act in combination with a common source of water-supply and yet independently with separate exhaust connections, whereby a smooth and easy movement of the valves is insured and said valves rendered readily controllable.

In order to provide for the use of any desired number of valves and the ready repair of the same without shutting down the machinery, I preferably construct the casing in two parts or sections 24 and 25, having their meeting faces fitting closely together and suitably connected, as by means of a dovetailed key or tongue 26 on one engaging a dovetailed groove 27 in the other, as clearly shown in Fig. 3. With this construction one of the waste-passages will be formed in one section of the casing and the other waste-passage in the other section of the casing, while a single water-supply passage 14 will be formed by intercommunicating ports in the meeting faces of said valve-casing sections. Each set of valves will thus have a separate waste-passage and a supply-passage which is common to both, but may be divided by closing up the ports in the meeting faces of the sections. By interposing one or more intermediate casing-sections between the said sections 24 25 the number of valves employed may be increased at will, and in case of injury to either one of the valves the section containing the same may be removed and a new corresponding section substituted therefor without the necessity of removing the other section or stopping the operation of the machine for any great length of time. The advantages of this construction will be apparent.

From the foregoing description, taken in connection with the accompanying drawings, the construction and mode of operation of my improved valve mechanism will be readily understood. Changes in the form, proportion, and minor details of construction may be made within the scope of the invention without departing from the spirit or sacrificing any of the advantages thereof.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In hydraulic valve mechanism, a divided casing having independent waste-passages on

opposite sides thereof and extending around three sides of each division of the casing, one or more independent valve-chambers on each side of the casing and with which the waste-passage on that side is in communication, a double-acting piston-valve within each valve-chamber, a supply-passage formed in the casing and common to all the valve-chambers, and exhaust-pipes for the waste-passages, one communicating with the upper portion of one waste-passage and the other with the lower portion of the other waste-passage, substantially as described.

2. In hydraulic valve mechanism, a casing composed of separable sections, one or more individual valve-chambers formed in each section, a double-acting piston-valve within each chamber, a waste-passage formed in each section and independent of each other, and a supply-passage formed in the casing and common to all the valve-chambers, substantially as described.

3. In hydraulic valve mechanism, a casing composed of separable sections, one section having a dovetailed groove to receive a dovetailed key on the other section, one or more individual valve-chambers formed in each section, a double-acting piston-valve within each chamber, a waste-passage formed in each section and independent of each other, and a supply-passage formed in the casing and common to all the valve-chambers, substantially as described.

4. In hydraulic valve mechanism, a casing composed of separable sections, one section having a dovetailed groove to receive a dovetailed key on the other section, one or more individual valve-chambers formed in each section, a waste-passage formed in each section, the waste-passage in one section being independent of the waste-passage in the other section, waste-pipes communicating with opposite sides of the waste-passages, and a supply-passage formed in the casing and common to all the valve-chambers, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ELMER E. E. MEARS.

Witnesses:

CLARENCE E. STEWART,  
LUCIEN S. DIETRICH.