(No Model.)

2 Sheets—Sheet 1.

G. B. LAMB.

HYDRAULIC VALVE.

No. 336,724. Patented Feb. 23, 1886.

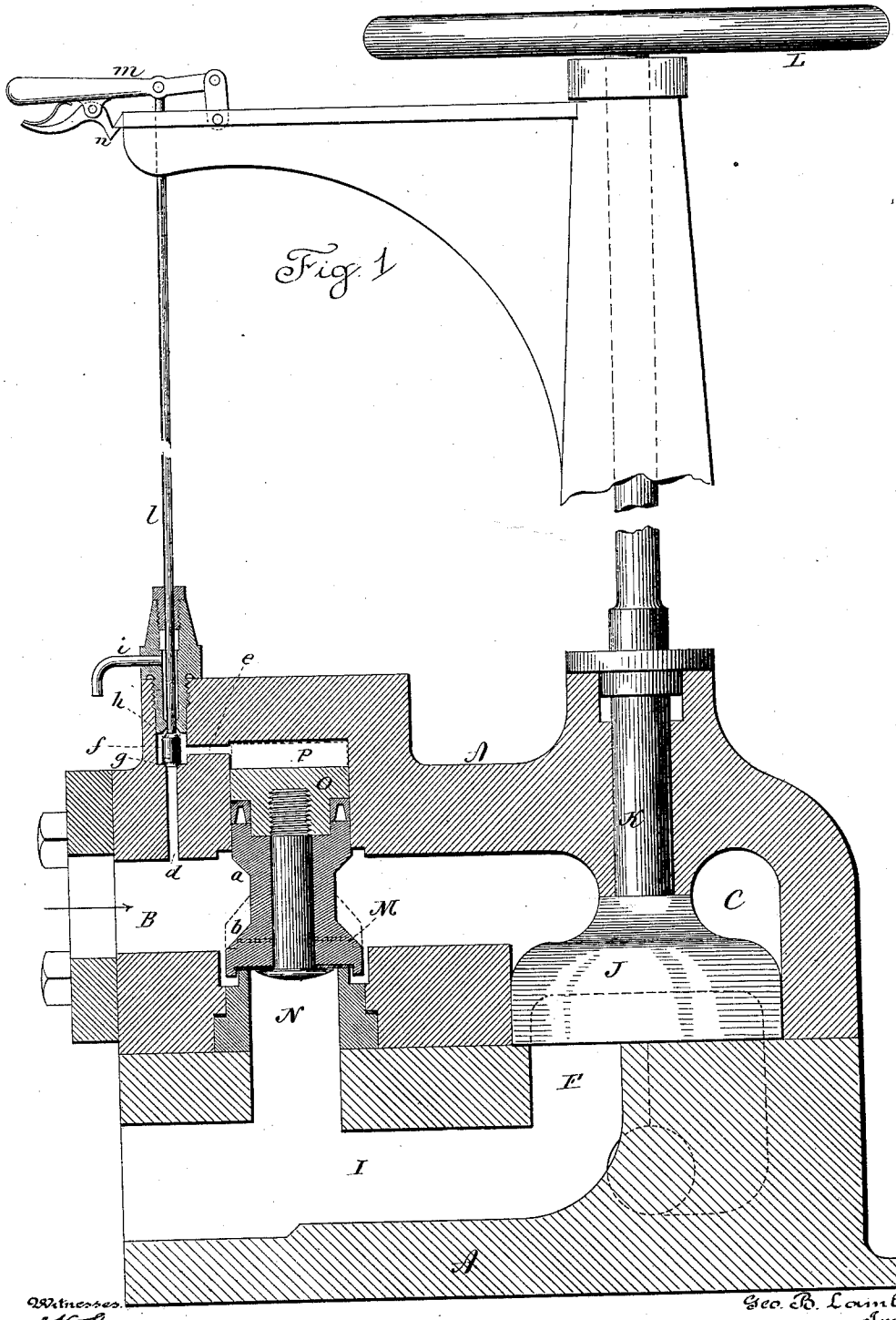


Fig. 1

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(No Model.) 2 Sheets—Sheet 2.

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HYDRAULIC VALVE.

No. 336,724. Patented Feb. 23, 1886.

Fig. 2.

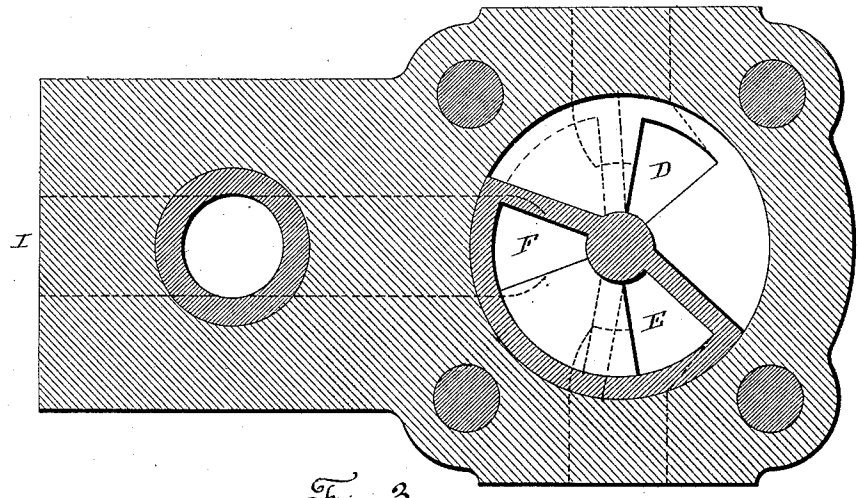
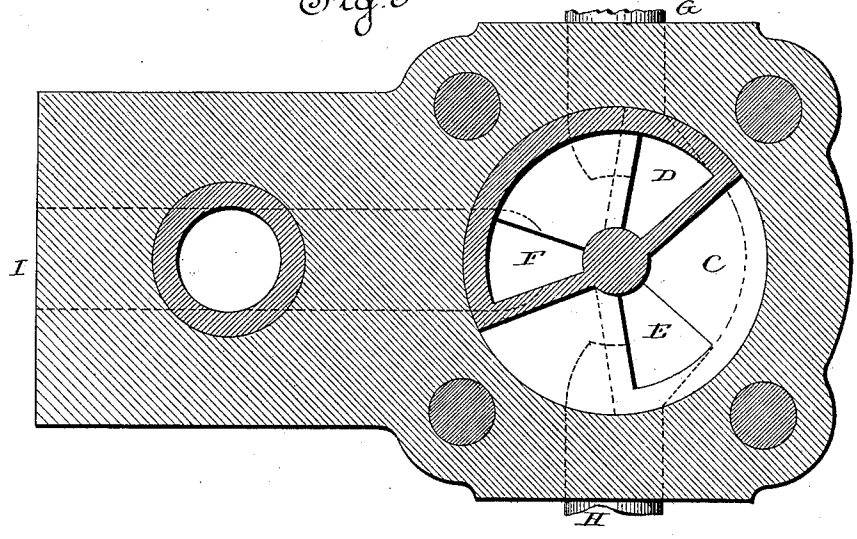


Fig. 3



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UNITED STATES PATENT OFFICE.

GEORGE B. LAMB, OF WATERBURY, CONN., ASSIGNOR TO THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, OF SAME PLACE.

HYDRAULIC VALVE.

SPECIFICATION forming part of Letters Patent No. 336,724, dated February 23, 1886.

Application filed January 9, 1886. Serial No. 188,062. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. LAMB, of Waterbury, in the county of New Haven and State of Connecticut, have invented a new Improvement in Hydraulic Valves; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a vertical section through the casing and check-valve, showing side view of the principal valve; Fig. 2, a horizontal section cutting through the principal valve just above the valve-seat, and showing the valve in the position of connecting one port with the exhaust, leaving the other port open to the chamber, broken lines indicating different positions of the valve; Fig. 3, the same section as in Fig. 2, showing the valve as adjusted to include the exhaust-port and the port which was before open in the chamber, leaving the port which was before connected with the exhaust open into the chamber, broken lines indicating the different position of the valve.

This invention relates to an improvement in the valve mechanism for hydraulic-press work, specially designed and adapted to the apparatus commonly called a "draw-bench"—that is to say, an apparatus for drawing or reducing metal tubing, and like purposes. In this apparatus a cylinder is employed with a piston traveling therein, from which a rod extends, and to which rod the tube or thing to be drawn is attached, or by which the work may be forced through the dies. The piston is double-acting—water is admitted first at one side to force the piston in one direction and then upon the opposite side, releasing the water upon the first side, so as to return the piston.

In the work to which this invention is particularly adapted very great force is required to be applied to the piston. The pump which supplies the water under very high pressure is necessarily a constantly-working pump, or so arranged that it is difficult to make an instantaneous stopping of the force of water when occasion requires; hence difficulties arise in draw-bench work, owing to the fact that the pump must be stopped to relieve the pressure upon the piston.

The object of my invention is the arrangement of a valve mechanism whereby the pressure of water upon the piston, while readily changed from one side to the other as occasion may require, may be instantly relieved without stopping the flow or force of the water; and it consists in the mechanism hereinafter described, and more particularly recited in the claims.

In illustrating my invention I do not show the draw-bench and its cylinder, as such are too well known to require such illustration or description.

A represents the valve-casing, into which is the water-inlet B, the passage therefrom leading into the valve-chamber C. The valve-chamber is circular in form, as seen in Figs. 2 and 3. In the bottom or floor of the valve-chamber are three ports, D, E, and F. The port D leads down through a passage, G, to one side of the piston, and the port E leads down through a passage, H, to the opposite side of the piston, while the port F leads down into an exhaust-passage, I, the several passages G, H, and I indicated in Figs. 2 and 3 in broken lines. In the valve-chamber a rotary valve, J, is arranged, segment-shaped and recessed upon its under side, as indicated in broken lines, Fig. 1. This valve is fixed to the lower end of a shaft, K, which extends upward to some convenient position, to which a hand-wheel, L, or other device is applied, whereby the valve may be rotated upon its seat or bottom of the valve-chamber C. The recess in the valve is in area sufficient to include either two of the ports—say, as seen in Fig. 1, to include the ports E and F, or, as seen in Fig. 3, to include the ports D and F, or, turned to what may be termed the third position, the two ports D and F would be included in the recess; but when either two are included the other one is open to the valve-chamber. The water as it is forced through the passage B into the valve-chamber C, with the valve, say, in the position seen in Fig. 2, will flow through the port D to one side of the piston, while the water which may have previously been in

troduced upon the opposite side of the piston will return up through the port E into the valve, thence over and down through the exit-port F to the escape-passage I. Turning the valve from the position seen in Fig. 1 to that seen in Fig. 2, the port D will be cut off from the valve-chamber and the port E opened thereto; hence the inflow of water will be through the port E to the reverse side of the piston, and the water previously introduced will escape through the port D and through the valve down through the port F to the exhaust-passage I; or, if turned to the third position, (indicated in broken lines, Fig. 3,) so that the two ports D E are inclosed by the valve, the port F will be open to the valve-chamber, and the flow of water will simply be into the valve-chamber, out through the port F to the exhaust, without effect upon the piston. Turned to the fourth position (indicated in broken lines, Fig. 2,) the valve closes the exhaust, leaving the two ports D E open to the flow, so that the water will be forced into both ends of the cylinder. The area of the piston being different upon its two sides—that is, less upon one side than the other—to the extent of the area of the rod, such introduction of the water at both ends will cause the piston and rod to be forced outward under the differential pressure upon its two sides. Under this arrangement of valve the flow of water, if constant, must be relieved only by the stopping of the pump or the turning of the valve J to permit the inflow to pass out through the exhaust. The area of the valve J is necessarily large; hence when under the extreme pressure of the water very considerable power is required to turn the valve, and instantaneous relief in that direction is practically impossible. To make such relief instantaneous and without necessarily changing the position of the valve J, I arrange a check-valve, M, in the inlet-passage, or at some point between the inlet and the valve-chamber. The valve at its lower end rests upon a seat, through which a passage, N, leads to the outlet or exhaust I. Its upper end is in the form of a piston, O, fitting closely in a corresponding cylindrical chamber, P, and so that in its normal condition the valve rests upon its seat and closes the passage N. The area of the piston in the chamber P is considerably greater than the exposed area of the valve in the passage B. The valve is reduced in diameter in the passage, so as to form a downward bearing-surface, *b*, and also exposes a considerable surface around the valve-seat below. The area of the surface *a* plus the under surface of the valve exposed in the passage B is greater than the exposed surface *b;* hence the action of the water in the passage upon the valve M is to raise the valve from its seat and open the passage N. From the passage B is an auxiliary passage, *d*, extending vertically upward, and from the chamber P above the piston a similar passage, *e*, leads horizontally, both passages opening into a valve-chamber, in which a valve, *f*, is arranged, the axis of which is in line with the passage *d*. The upper end of the passage *d* forms a seat, *g*, for the valve, and the upper end of the valve-chamber forms a seat, *h*, for the valve directly over the seat *g* below. The valve is constructed at its two ends so as to close upon either of the said seats, according to the position in which it is set. When the valve is forced down upon the seat *g*, it closes the passage *d* and cuts off communication between the passage B and the piston-chamber, leaving communication open from the piston-chamber through the passage *e* out through the opening in the valve-seat *h* above the valve; but when the valve *f* is raised to come to a rest upon the valve-seat *h* it closes that escape and opens communication between the passage B and the chamber P above the piston through the passages *d e*. The valve-seat *h* opens upward to an escape-tube, *i*, and so that when the valve *f* is in its down position to close the passage *d* communication is opened from the chamber P above the piston outward through the tube *i* to the atmosphere or reservoir, as the case may be; but with the valve raised, as indicated in broken lines, then the face of the piston is open to the pressure of the inflowing water.

In operation the valve *f* is raised so as to open communication between the inflowing passage and the face of the piston, and so that the water under pressure will enter the piston-chamber P, and thereby hold the piston firmly upon its seat to close the passage N, and if in such operation it should at any time be desirable to instantly cut off the action of the water, the valve *f* is forced down upon its seat *g*, so as to close the communication between the inflowing water and the face of the piston, which movement of the valve opens escape from the piston-chamber outward for the water which may be therein. In this case the pressure of the water is instantly applied to the valve M, as before described, to raise that valve, as indicated in broken lines, Fig. 1, thereby opening the passage N and turning the inflowing water from the valve-chamber into the escape or exhaust passage I. The action of the water upon the piston is at once relieved and without necessarily turning the valve J; but the opening of the valve M to permit the escape of the inflow, or a considerable portion of it, so greatly relieves the pressure upon the valve J that it may be freely and easily turned upon its seat. The valve M may therefore be used as an instantaneous change in the flow of the water, or as a relief upon the valve J.

To conveniently operate the valve *f*, it is attached to a rod, *l*, extending to a convenient position. It is hung to a lever, *m*, provided with a latch, *n*, by which the valve may be locked in a position to cut off communication between the piston-chamber and the inlet-

passage, and so that while so held the pressure of the water upon the valve or its action upon the piston is substantially released.

While this valve mechanism is specially adapted for a draw-bench, it will be evident to those skilled in apparatus requiring hydraulic pressure that it may be applied to great advantage in other classes of work, as in powerful hydraulic presses. I therefore do not wish to be understood as limiting my invention to any specific purpose.

While preferring a rotating valve to connect the respective ports, any of the known equivalents for such a valve and for such purpose may be employed, such equivalents being too well known to require illustration or description.

I claim—

1. In a valve mechanism for changing the direction of the flow of water under pressure, the valve-chamber C, having three ports leading therefrom to different passages, with an inlet-passage opening into said chamber, a valve in said chamber constructed with a recess upon its under side, the said valve adapted to be moved to bring the said recess in the face of the valve to register with any two of said ports, leaving the other port open into the chamber, one of said ports communicating with an escape or exhaust passage, a passage between the inlet to the valve-chamber and the said exhaust-passage, with a valve arranged in said connecting-passage between the inlet and exhaust, the said valve adapted to open or close said connecting-passage, and also constructed with a piston working in a corresponding chamber in the valve-casing and with differential surfaces in said inlet-passage, a passage leading from the inlet-passage into the piston-chamber, the said last-named passage also leading outward to the atmosphere, and a valve arranged in said passage adapted to close it between the piston-chamber and the inlet-passage or between the said piston-chamber and the atmosphere, as the case may be, substantially as described.

2. A valve-casing having a valve-chamber, C, formed therein, three ports, D E F, in the floor of said chamber, one of said ports leading to an exhaust or exit passage, a valve, J, fixed to a shaft, K, and adapted for rotary movement in said chamber, the under surface of the said valve recessed and working upon the floor of said chamber as a seat, the said under surface of the valve of an area sufficient to cover either two of the said ports, and the valve constructed with a recess or chamber upon its under surface adapted to include either two of the said ports, accordingly as it may be rotated in said chamber, leaving the third port open into the chamber, an inlet-passage, B, leading to said valve-chamber, the passage N, connecting the inlet-passage B with the exhaust or outlet passage from the valve-chamber, the said passage N terminating in a valve-seat in said passage B, a valve, M, arranged in said passage and resting upon said valve-seat to close said passage N, the end of the valve M opposite said seat constructed in the form of a piston, and the casing constructed with a corresponding piston-chamber, within which the said piston portion of the valve M may work, the said valve M constructed with a bearing-surface upon which the pressure of the water in the said passage may act in a direction from the seat of said valve, and whereby under such pressure, the valve being free, it will be raised, the casing also constructed with passages *d e*, leading from the said inlet-passage to the piston-chamber above the piston portion of the valve M, the said passage *e* also open to the atmosphere, with a valve-seat in said passages each side the said passage *e*, and a valve, *f*, arranged therein, adapted to close either the passage into the said piston-chamber or the passage therefrom, as the case may be, substantially as described, and whereby the pressure of the water may be applied through said passage *d* to force the said valve M to its seat and close the passage N or the pressure cut-off and the piston-chamber open to the atmosphere.

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