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W. J. HAGMAN.

MEANS FOR VARYING AREAS OF PLUNGERS OF HYDRAULIC MACHINES.

(Application filed Nov. 7, 1900.)

(No Model.)

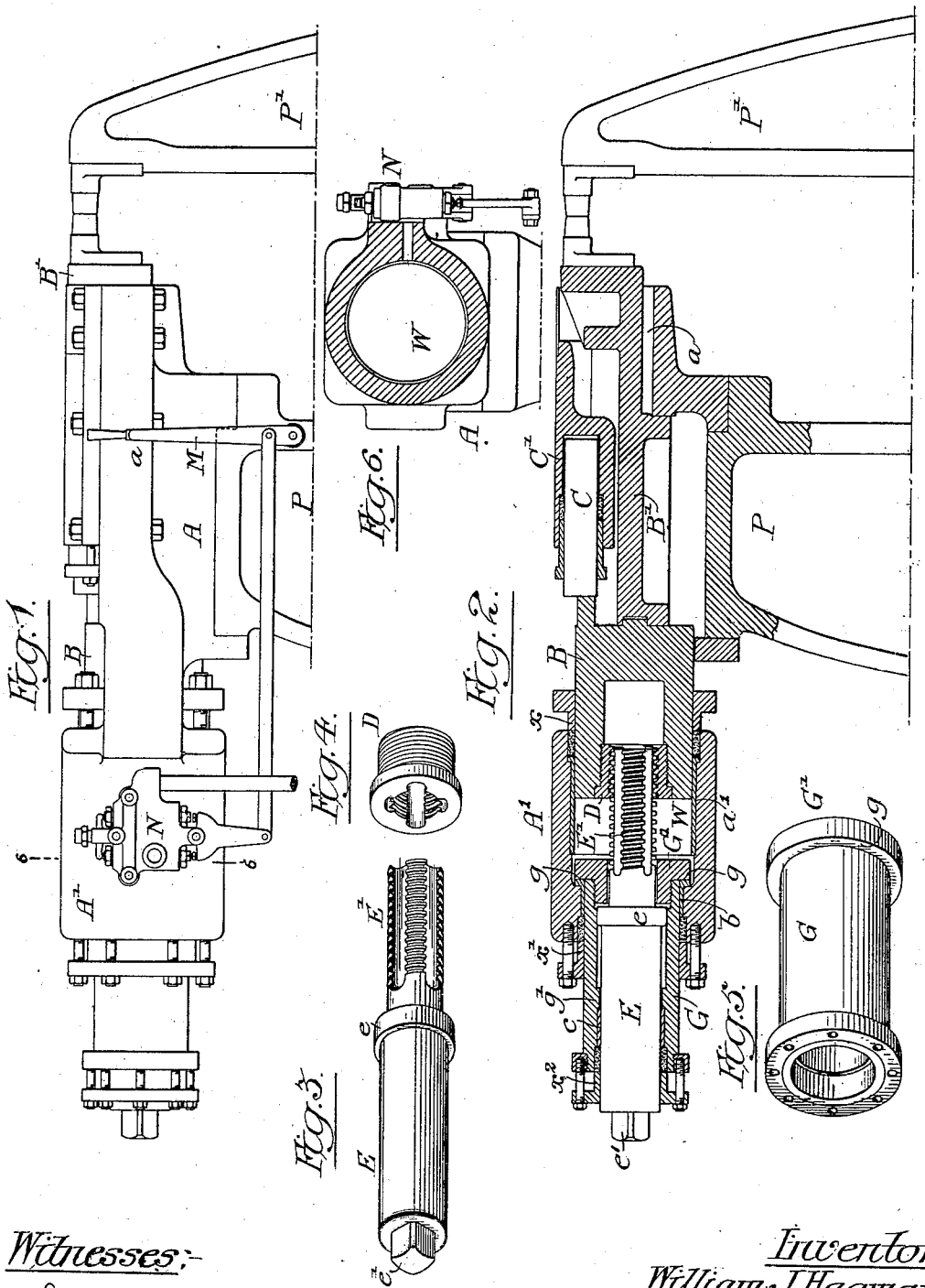

FIG. 1.

FIG. 6.

FIG. 2.

FIG. 4.

FIG. 3.

FIG. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM JOSEPH HAGMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE NILES, BEMENT, POND COMPANY, OF SAME PLACE AND JERSEY CITY, NEW JERSEY.

MEANS FOR VARYING AREAS OF PLUNGERS OF HYDRAULIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 676,251, dated June 11, 1901.

Application filed November 7, 1900. Serial No. 35,748. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JOSEPH HAGMAN, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Means for Varying the Areas of Plungers of Hydraulic Machines, of which the following is a specification.

My invention relates to certain improvements in hydraulic machines in which different pressures are desirable—such, for instance, as hydraulic riveting-machines.

The object of my invention is to obtain different pressures without multiplying the cylinders and without complicating the valve mechanism, at the same time providing a machine which can be packed without dismantling the parts.

In the accompanying drawings, Figure 1 is a side view of the upper portion of a hydraulic riveting-machine, illustrating my invention. Fig. 2 is a view similar to Fig. 1, showing parts in section. Figs. 3, 4, and 5 are perspective views of detached parts of the machine; and Fig. 6 is a sectional view on the line 6 6, Fig. 1, showing the passage between the valve mechanism and the interior of the cylinder.

In the drawings I have shown my invention applied to a riveting-machine, but it will be understood that it may be applied to any fluid-operated machine requiring more than a single pressure.

P is a standard, and P′ is a stake, forming part of a frame of a riveting-machine.

A is a frame secured to the standard P. Forming part of this frame in the present instance is the cylinder A′ and the guideways *a a* for the riveting-slide B′. On the riveting-slide B′ and stake P′ are the ordinary riveting-dies. A cylinder A′ has a bushing *a′* and a stuffing-box *x*, and extending through this box into the forward end of the cylinder is the main plunger B, which is connected to the rear of the riveting-slide B′ by a bolt or bolts. (Not shown in the drawings.)

Mounted in the frame A above the slide B is a return-cylinder C′, having a plunger C bearing against the forward end of the plunger B.

The cylinder A′ is open at the rear end, having an inwardly-projecting portion or flange, which holds in place a flanged bushing *b*, there being also a stuffing-box *x′* at the said rear end. Extending into the rear end of the cylinder is an auxiliary piston G, having a head G′ at its inner end, in the present instance made separate from the piston and having a threaded portion screwed into the piston G, which is tubular for the reception of a second auxiliary piston E.

In the interior of the tubular piston G is an annular rib *g′*, having back of it a bushing *c*, there being a stuffing-box x^2 on the outer end of said piston through which the piston E extends. This piston has a head *e* forming a shoulder, and a threaded stem E′ extending beyond the head *e*, the threads thereon being interrupted in the present instance, as shown in Fig. 3. The outer end *e′* of the piston is squared for the reception of a wrench by which the piston can be turned.

The main plunger B is hollow and has an internal screw-thread.

D is a nut having an external screw-thread, a flange, and an internal interrupted thread designed to mesh with the threads of the stem E′. The nut D can be attached in any suitable manner to the rear of the plunger B.

Valve mechanism N, operated by the lever M, is attached to the side of the machine, and a passage Q connects it with the main cylinder, as shown in Fig. 6. The return-cylinder receives its pressure fluid from any point in the system.

The operation of my device is as follows: In order to obtain the maximum working pressure at the riveting-dies, the screw-stem E′ is detached from the nut D by turning the piston E. This allows the full pressure of the water admitted to the space W to be exerted on the plunger B. This water-pressure is also exerted on the face of the stem E′, the head or shoulder *e* keeping the piston E in the piston G by engaging the rib *g′* thereof. By turning the piston E when it is at the forward end of its stroke and when the plunger B, with the slide B′, is in the out position shown in the drawings the threaded stem E′ will engage the threads of the nut D, coupling it to the plunger B. When now the water is admitted to the space W, the piston E will move forward with the main plunger B, and the

available working pressure at the dies will be diminished by as much as the active area of the face of the plunger B has been diminished by the area of the piston E. If now the plunger B is moved in contact with the head of the piston G and the screw E′ turned so as to couple it to the plunger, when water is admitted the pistons G and E will both move forward with the plunger B, but the available force at the riveting-dies will only be that due to the pressure exerted on the annular surface *g* of the rear of the head G′ of the piston G. Since the area is proportionately small, it will give the minimum pressure.

By the above means it will be seen that a single plunger is used, which when acting alone exerts its maximum pressure, when coupled to one auxiliary piston exerts an intermediate pressure, and when a second piston is attached the minimum pressure is attained. The application of this idea is not confined to riveting-machines, since it will be understood by those skilled in the art that it may be applied to any of the well-known forms of hydraulic or other machinery—such as punches, shears, &c.—in which a variable pressure at the plunger is required.

It will be understood that I do not confine myself to the use of interrupted threads in coupling the auxiliary pistons to the main plunger and to one another, as I may employ any other mechanical device to accomplish this end.

It is to be noted that by my improved device the pistons are all outside packed, the various stuffing-boxes being in positions which can easily be reached and overhauled without disturbing any other part of the machine.

I claim as my invention—

1. In a riveting or similar hydraulic machine capable of exerting variable pressures, the combination of a frame, a cylinder thereon, a moving slide, a plunger connected to said slide, and means extending through the cylinder to the outside of the same for varying the area of said plunger exposed to the motive fluid, said means being positively secured to the plunger and held thereto during the entire length of stroke, substantially as described.

2. The combination in a riveting or similar hydraulic machine, of a frame, a moving slide and a cylinder thereon, a plunger operating in said cylinder, a piston and mechanism attached thereto extending through the cylinder to the outside of the same, said piston being constructed to be coupled to or released from said plunger at will, the relative positions of the piston and of the plunger remaining the same throughout the entire stroke, substantially as described.

3. The combination in a riveting or similar hydraulic machine, of a frame, guides thereon, a moving slide operated in said guides and having connected to it a main plunger, a cylinder on the frame for said plunger, auxiliary pistons in the cylinder, and mechanism extending to the outside of the cylinder for coupling and disconnecting said pistons and the plunger, the relative positions of the pistons and the plunger remaining unaltered during operation throughout the entire stroke of said plunger, substantially as described.

4. A riveting or similar hydraulic machine consisting of a frame, a moving slide and a cylinder thereon, a hollow piston in the cylinder connected to the slide and having screw-threads in its interior, a second piston in the cylinder also having screw-threads thereon and means for turning the said second piston whereby the two pistons may be coupled together, substantially as described.

5. In a riveting or similar hydraulic machine, the combination of a frame, a cylinder thereon, a plunger in the cylinder having attached to it a moving slide, guides for said slide, two auxiliary pistons in said cylinder, one within the other, a threaded stem on one of said pistons and threads on the plunger whereby either one or both of the auxiliary pistons may be coupled to the plunger, substantially as described.

6. The combination in a riveting or similar hydraulic machine, of a supporting-frame, a moving slide and a cylinder thereon, a plunger in the cylinder connected to the moving slide, said plunger having an internal interrupted thread, a piston in the cylinder having an interrupted thread thereon, and means for turning the piston whereby, when the pistons have been moved together, they may be coupled, substantially as described.

7. The combination in a riveting or similar hydraulic machine of a frame, a moving slide and a cylinder on said frame, a hollow piston in the cylinder connected to the moving slide, a nut in said piston having internal interrupted threads, two auxiliary pistons in the said cylinder, one within the other, the inner one having a stem with interrupted threads thereon, said pistons being so constructed that when the outer section of the threaded stem of the inner piston engages the plunger, said plunger and the inner piston are coupled together, and when the inner section of the threaded stem of said piston engages the plunger, the two auxiliary pistons are coupled to said plunger, substantially as described.

8. In a riveting or similar hydraulic machine, the combination of a supporting-frame, a cylinder on one arm thereof, guides, a moving slide constructed to operate in the guides and having attached to it a plunger which works in said cylinder, auxiliary pistons in the cylinder, with means for coupling either one or all of said pistons to the plunger, and outside-packed stuffing-boxes for the plunger and for each of the pistons, substantially as described.

9. In a riveting or similar hydraulic machine, the combination with a frame, of a moving slide and a return-cylinder, of a main

cylinder flanged internally at the rear end, a hollow plunger in the forward end of said cylinder and attached to the moving slide, a tubular piston flanged both internally and externally, a solid piston within the tubular piston and having a shoulder and means for coupling either one or both of said pistons to said plunger whereby three different pressures for riveting or other service may be obtained, substantially as described.

10. In a riveting or similar hydraulic machine, the combination of a supporting-frame, a cylinder on one arm thereof, guides, a moving slide constructed to operate in the guides and having attached to it a plunger which works in said cylinder, auxiliary pistons in the cylinder, with means for coupling either one or all of said pistons to the plunger, and a single passage-way opening into the cylinder, between the pistons, through which the motive fluid may enter and exhaust, substantially as described.

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

WILLIAM JOSEPH HAGMAN.

Witnesses:
WILLIAM E. BRADLEY,
JOS. H. KLEIN.