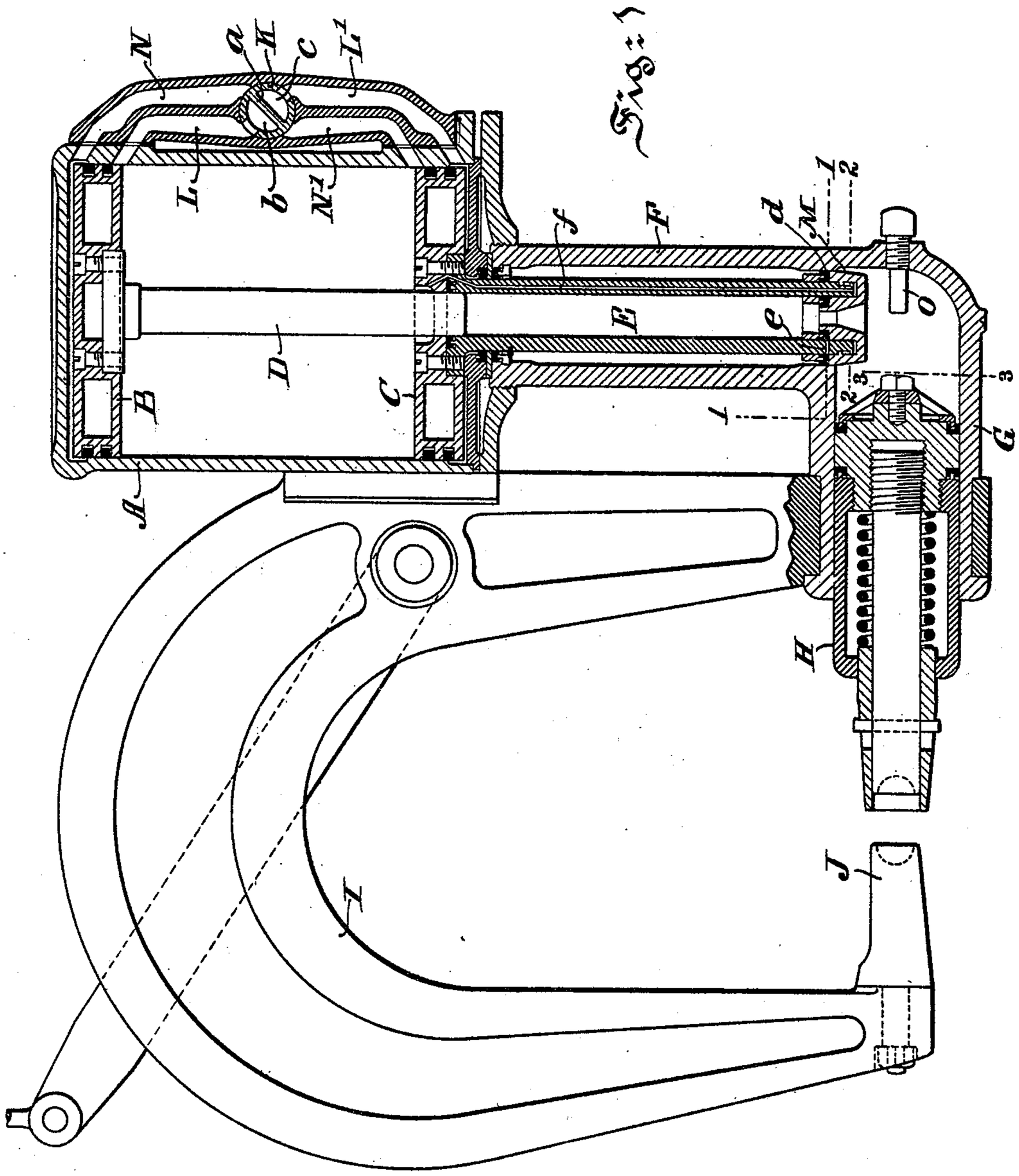
(No Model.)

2 Sheets—Sheet 1.

T. J. WINANS.

RIVETING MACHINE.

No. 582,839. Patented May 18, 1897.



Witnesses:
W. A. Schaefer.
J. Craig Shields

Inventor.
Thomas J. Winans.
By his Attorneys Chas. A. Rutter.

(No Model.) 2 Sheets—Sheet 2.

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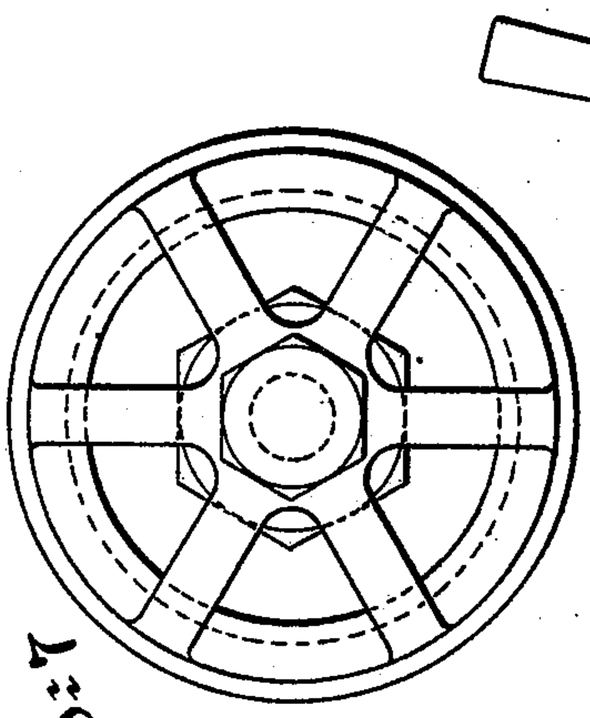

Fig. 1.

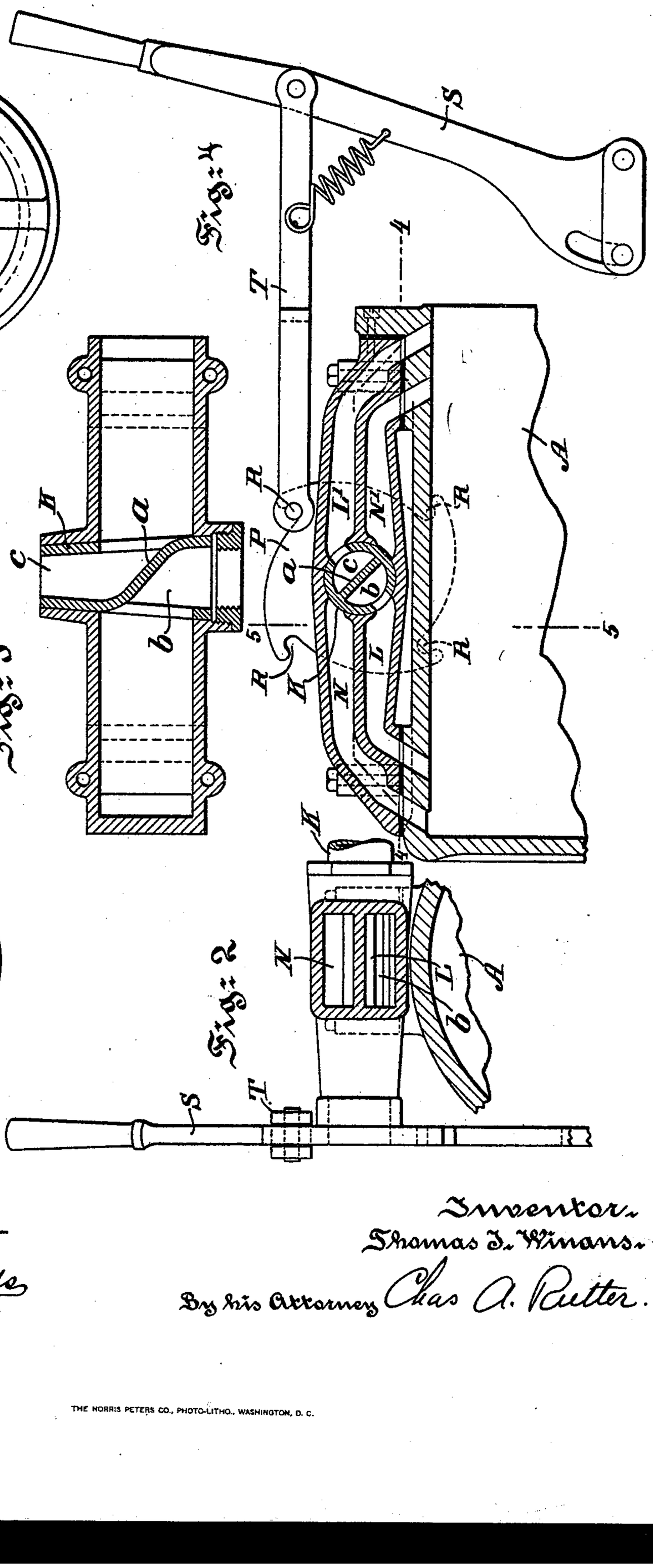

Fig. 2.

Fig. 3.

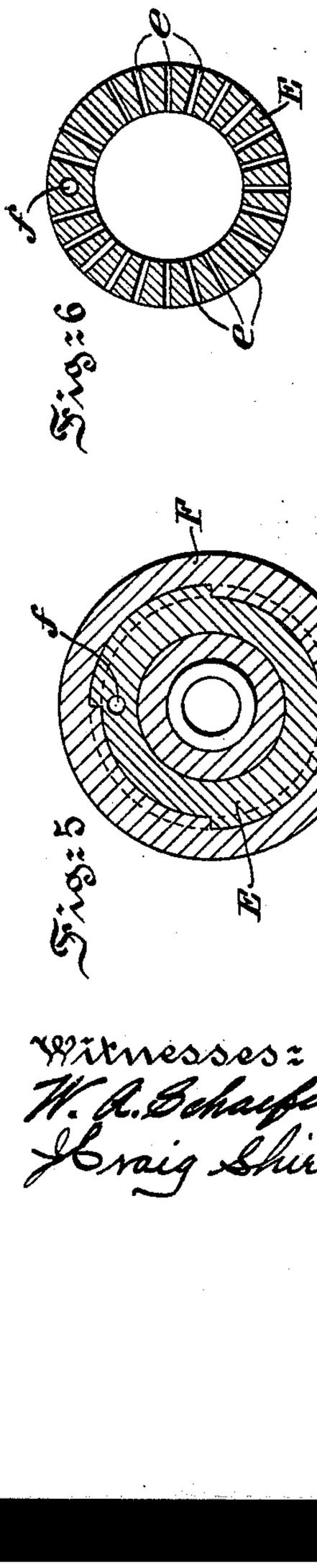

Fig. 4.

Fig. 5.

Witnesses:
W. A. Schaefer.
Craig Shields

Inventor.
Thomas J. Winans.
By his Attorney Chas A. Retter.

UNITED STATES PATENT OFFICE.

THOMAS J. WINANS, OF BINGHAMTON, NEW YORK.

RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 582,839, dated May 18, 1897.

Application filed September 23, 1896. Serial No. 606,723. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. WINANS, a citizen of the United States, and a resident of Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Riveting-Machines, of which the following is a specification.

My invention relates to improvements in hydraulic riveting-machines; and the object of my invention is to furnish a hydraulic riveting-machine for heavy work which will be very compact and which may be operated without the aid of a quick-running pump or an accumulator and the necessary heavy and troublesome piping that the use of an accumulator or pump entails.

In the accompanying drawings, forming part of this specification and in which similar letters of reference indicate similar parts throughout the several views, Figure 1 is a central sectional elevation of my improved riveting-machine; Fig. 2, a section of Fig. 4 on line 5 5; Fig. 3, a section of Fig. 4 on line 4 4; Fig. 4, a central sectional elevation of part of the air or steam cylinder, and of the valve and valve-ports through which air or steam is conducted to or away from this cylinder, showing in side elevation means for operating the valve; Fig. 5, an enlarged section of Fig. 1 on line 2 2; Fig. 6, an enlarged section of Fig. 1 on line 1 1; and Fig. 7, an end elevation of the hydraulic plunger, Fig. 1.

A is the air or steam cylinder, within which are two pistons B C.

D is a piston-rod or plunger carried by piston B; E, a hollow piston-rod or plunger carried by piston C. The piston-rod or plunger D is adapted to work in the hollow rod E, and the rod E in a cylinder F, which is attached to or forms part of the casting of cylinder A. The cylinder F is shown in the drawings connected at its lower end with a cylinder G, in which is a piston H of well-known construction, which is used to form the head upon the rivet. The cylinder G forms a continuation of the cylinder F, and, if desired, it may be in line with this latter cylinder. The cylinders F and G, as well as the hollow piston-rod E, contain the hydraulic liquid.

I is a yoke which is attached to cylinders A and G, the lower arm of which carries the anvil J, which holds one end of the rivet while a head is being formed upon its other end.

At the commencement of the operation of the machine both pistons B C are at the far end of the cylinder A. The valve K, which is a hollow plug divided by a wall *a* into two compartments *b c*, the former of which communicates with the compressed air or steam space and the latter with the exhaust, is now turned so that the air or steam is admitted to port L and thence to the upper end of piston C, which it drives down to the bottom of cylinder A and the hollow piston-rod of which is driven down to the bottom of cylinder F, displacing in this cylinder and the cylinder G an amount of liquid equal to its volume and driving out the piston H a corresponding distance. Thus the first part of the stroke is performed with a comparatively small expenditure of power.

The piston E carries at its lower end a head M, which is adapted to engage and make a tight joint with the lower end of the cylinder F, which is contracted in diameter at this point for this purpose. At all other points the inside diameter of cylinder F is somewhat greater than the diameter of head M, so that the piston rod and head can play freely therein.

The piston C and its connected parts having been driven all the way down, the valve K is given a quarter-turn and the air or steam is admitted to the port N while the exhaust-port N′ is opened. The liquid that is between the piston E and cylinder F being now unable to escape forms a bearing against the head M and locks this head in place and prevents the piston C from rising during the completion of the driving of the rivet. The piston B is now driven down as far as may be necessary to form the head upon the rivet, the liquid in the cylinder G being under pressure of the piston-rod D, which is driven down in the hollow cylinder or piston E by the downward movement of the piston B, the piston-rod D driving the liquid out of the hollow piston E and into the rear end of the cylinder G, forcing the piston H outward and completing the formation of the head of the rivet at a high pressure. It will be observed that the area of the piston B is very much greater than the area of the end of its rod D, and hence the pressure exerted by the piston

D on the liquid is much greater than the initial pressure of the air or steam which is admitted to the top of piston B.

The piston B having reached the end of its downward stroke, the valve K is given another quarter-turn and admits steam to port L′, which returns pistons B C both to the upper end of the cylinder A, and the suction caused by the return of the piston-rods D E draws the piston H back to its first position or until its inner end is engaged by a stop O, projecting inward from the rear wall of the cylinder G.

In Fig. 4 I show a means for giving the necessary movement to the valve K, consisting of a disk P, furnished with four notches R, attached to the end of valve K, an operating-lever S and a connecting-link T, one end of which is pivoted to lever S and the other end of which is adapted to engage alternately the notches R in the disk P. When it is desired to turn the valve, the lever S is moved forward until the end of link T drops into the notch R when the lever S is drawn all the way back, turning the valve one-quarter turn.

The head M on the end of piston E is not rigidly secured to the piston, but has a small longitudinal play thereon.

d is a hydraulic packing carried by the head M.

e are a series of perforations passing through the walls of the hollow piston-rod. These perforations are shown in Figs. 1 and 6.

f, Figs. 1, 5, and 6, is a longitudinal hole bored from one end of the piston E to the other, a continuation of which passes through piston C.

When the piston C and its rod E are lifted from the position shown in Fig. 1, it is necessary that some of the liquid which fills the space between the piston-rod E and the cylinder F be permitted to escape in order to allow the head M to be drawn up from its seat. The first upward movement of the piston C draws up its piston-rod until the holes *e* therein reach the top of the packing *d*, when the liquid in the space between the piston E and the cylinder F runs along the top of the packing and through holes *e* to interior of piston-rod E, thus permitting enough of the liquid in the space between the piston-rod E and the cylinder F to escape to allow the head M to be raised from its seat. Should any liquid leak down along the rod E and settle in the space between the end of this rod and head M, it is, when the piston is again forced down, carried off through hole *f* to interior of cylinder A and escapes through exhaust-ports L or N′.

While I have described air or steam as the means for actuating the pistons B C, I do not desire to confine myself to these means, as in some cases it would be advantageous to use water under a low pressure in the cylinder A for operating these pistons.

Having thus described my invention, I claim—

1. The combination in a hydraulic machine of an air, steam, or low-pressure water cylinder, a hydraulic cylinder connected to said air, steam, or water cylinder, a piston within said air-cylinder, a hollow piston-rod carried by said piston extending downward into said hydraulic cylinder, a second piston within said air, steam, or water cylinder, a solid piston-rod carried by said piston adapted to pass down through said first piston into said hollow piston-rod, a piston in said hydraulic cylinder, and means for controlling the movements of said pistons within said air or steam cylinder.

2. The combination in a hydraulic riveting-machine of an air, steam, or low-pressure water cylinder, a hydraulic cylinder connected to said air, water, or steam cylinder, a piston within said air-cylinder, a hollow piston-rod carried by said piston extending downward into said hydraulic cylinder, a second piston within said air or steam cylinder, a solid piston-rod carried by said piston adapted to pass down through said first piston into said hollow piston-rod, means for locking said first piston and piston-rod while the second piston and piston-rod are descending, a piston in said hydraulic cylinder, and means for controlling the movements of said pistons within said air or steam cylinder.

3. The combination in a hydraulic machine of a hydraulic cylinder the diameter of which is contracted at one point, a hollow plunger of less diameter than and working in said cylinder, a head carried by said plunger adapted upon the completion of the stroke of said plunger to engage said contracted part of said cylinder to prevent the passage of liquid from the upper to the lower part of said cylinder or vice versa, a solid plunger or piston adapted to work in said hollow piston or plunger, and means for permitting the liquid to flow from the upper to the lower part of said hydraulic cylinder upon the first lifting of said hollow plunger and before said head is lifted from its seat in the contracted part of said hydraulic cylinder.

4. The combination in a hydraulic machine of a hydraulic cylinder the diameter of which is contracted at one point, a hollow plunger of less diameter than and working in said cylinder, a head carried by said plunger adapted upon the completion of the stroke of said plunger to engage said contracted part of said cylinder to prevent the passage of liquid from the upper to the lower part of said cylinder or vice versa, a solid plunger or piston adapted to work in said hollow piston or plunger, and perforations in said hollow plunger adapted to be closed automatically when the head on said plunger engages the contracted part of said hydraulic cylinder, and to be opened to permit liquid to pass from the upper part of said hydraulic cylinder to the interior of said hydraulic plunger before said head is moved from the contracted part of said cylinder.

5. In a steam, low-pressure water, or air actuated hydraulic machine, in combination, an air, water, or steam cylinder, a hydraulic cylinder the inside diameter of which is contracted at one point, a piston in said air or steam cylinder, a hollow piston-rod carried by said piston working in said hydraulic cylinder, a head carried on said piston-rod capable of a slight longitudinal movement thereon adapted when the piston is all the way down to make a tight joint with the contracted part of said hydraulic cylinder, a liquid passage or passages passing through the wall of said hollow piston-rod adapted to be closed to the passage of liquid when said piston is all the way down and open to the passage of liquid when said piston is lifted, a second piston in said air or steam cylinder and a solid piston-rod carried thereby adapted to pass centrally through said first piston and into said hollow piston-rod.

6. In a steam, low-pressure water, or air actuated hydraulic machine, in combination, an air, water, or steam cylinder, a hydraulic cylinder the inside diameter of which is contracted at one point, a piston in said air, water, or steam cylinder, a hollow piston-rod carried by said piston working in said hydraulic cylinder, a head carried on said piston-rod capable of a slight longitudinal movement thereon adapted when the piston is all the way down to engage and make a tight joint with the contracted part of said hydraulic cylinder, a liquid passage or passages passing through the wall of said hollow piston-rod adapted to be closed to the passage of liquid when said piston is all the way down and open to the passage of liquid when said piston is lifted, a perforation or perforations passing longitudinally upward through the wall of said hollow piston-rod and through the piston, a second piston in said air, water, or steam cylinder, and a solid piston-rod carried thereby adapted to pass centrally through said first piston and into said hollow piston-rod.

THOMAS J. WINANS.

Witnesses:
ELDON R. CARVER,
AHUIRON M. SPERRY.