No. 763,833. PATENTED JUNE 28, 1904.

C. B. ALBREE.

HYDRAULIC INTENSIFIER.

APPLICATION FILED JUNE 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

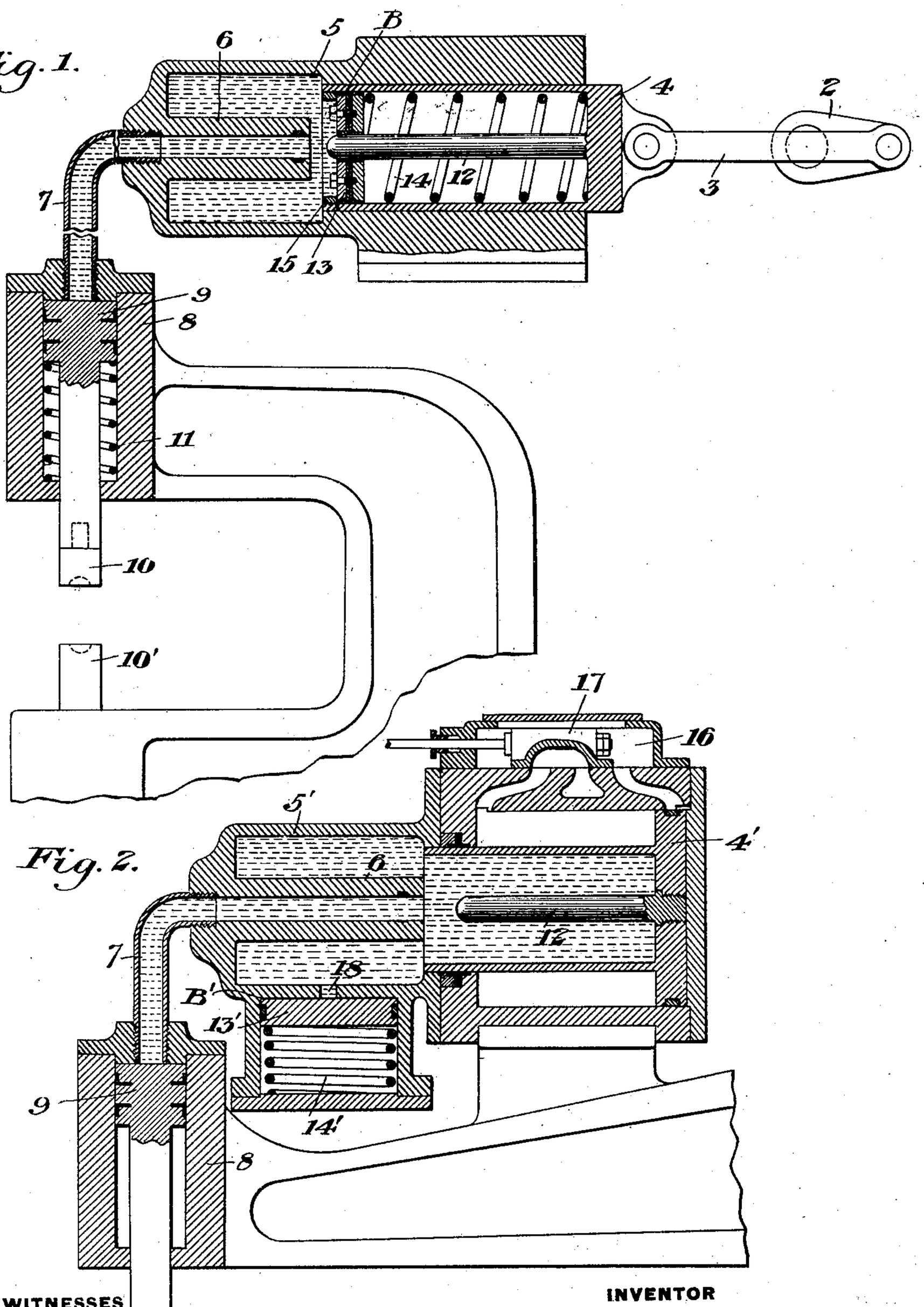

Fig. 2.

WITNESSES

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

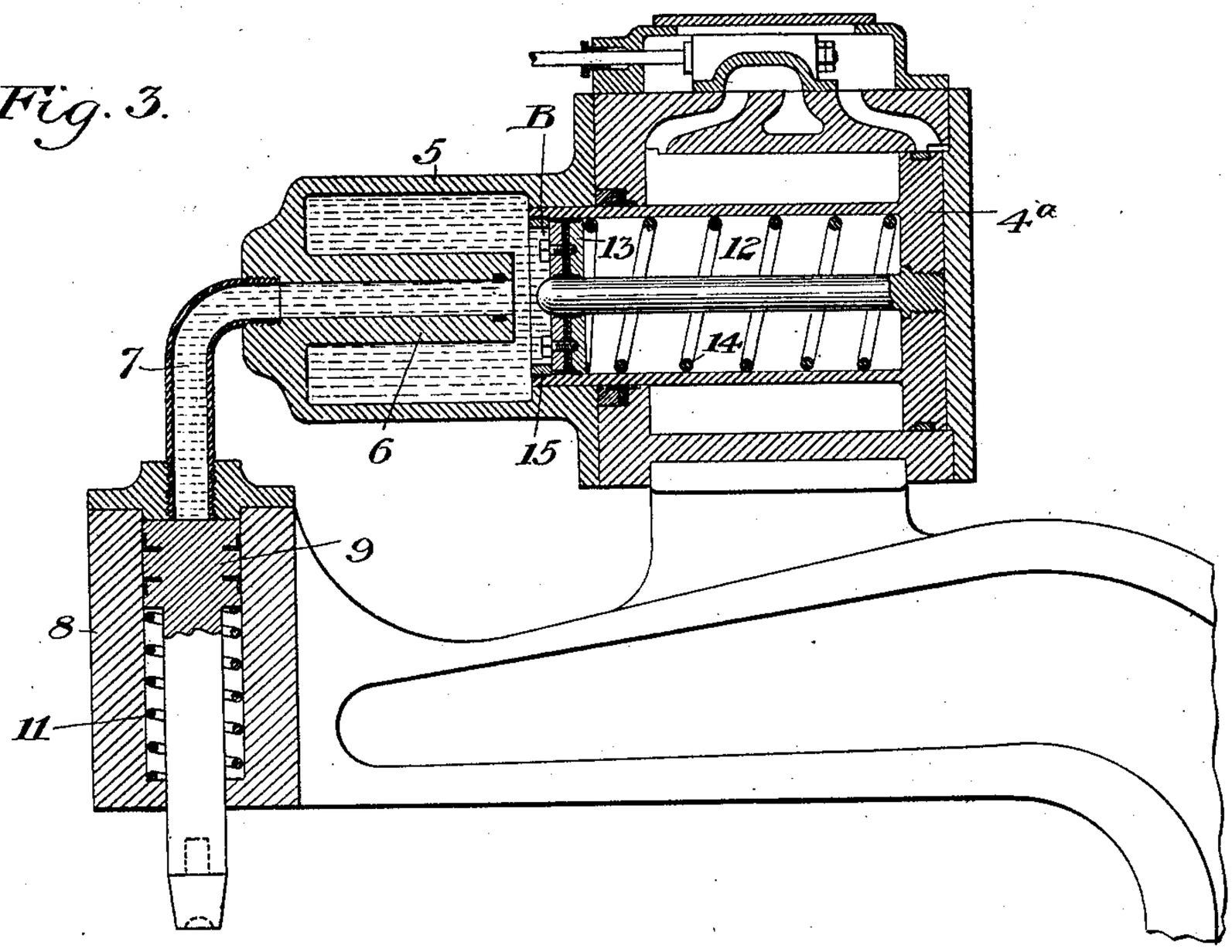
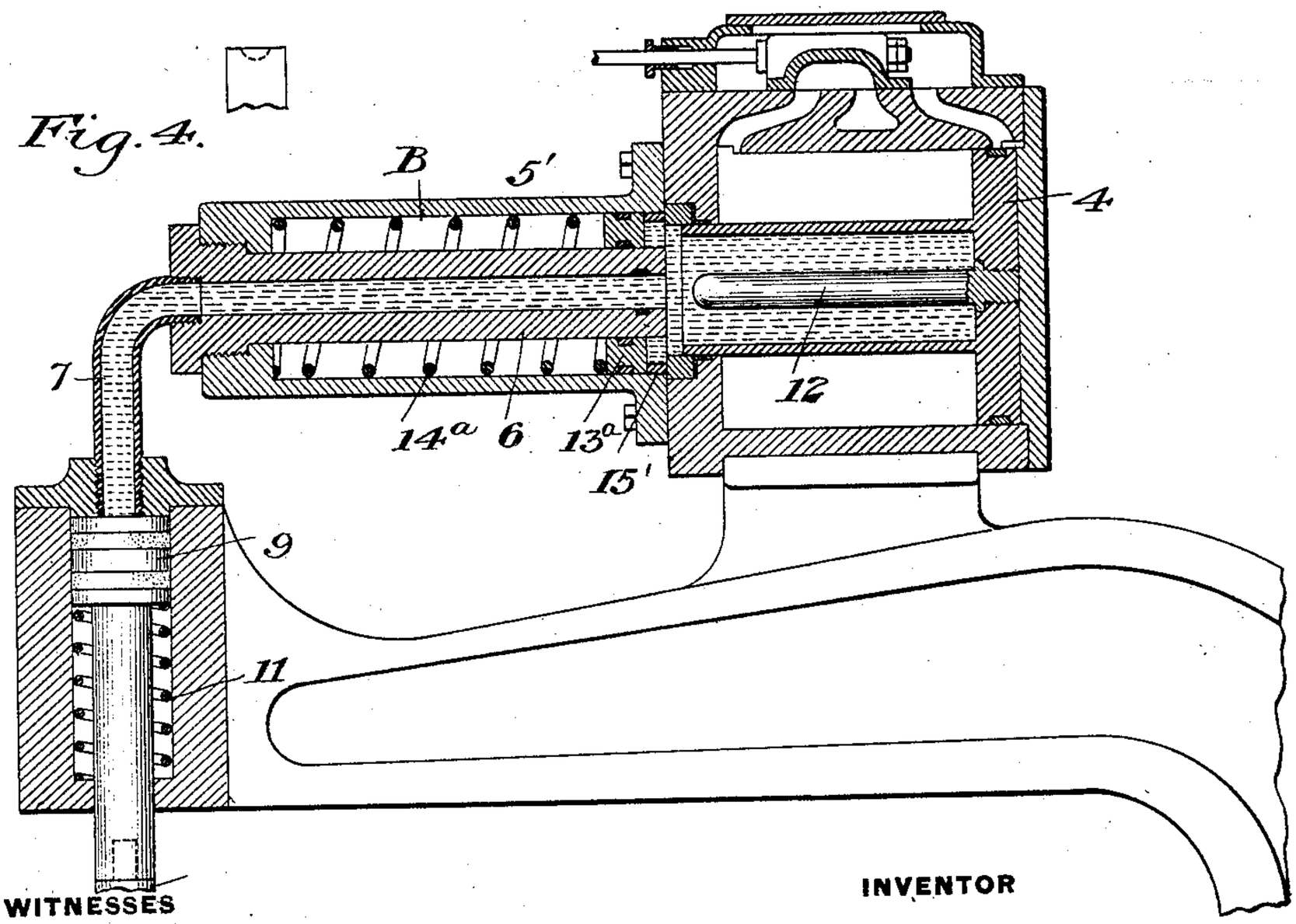


Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHESTER B. ALBREE, OF ALLEGHENY, PENNSYLVANIA.

HYDRAULIC INTENSIFIER.

SPECIFICATION forming part of Letters Patent No. 763,833, dated June 28, 1904.

Application filed June 30, 1903. Serial No. 163,675. (No model.)

To all whom it may concern:

Be it known that I, CHESTER B. ALBREE, of Allegheny, Allegheny county, Pennsylvania, have invented a new and useful Hydraulic Intensifier, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows in vertical section a machine constructed in accordance with my invention. Figs. 2, 3, and 4 are similar views showing modified constructions thereof.

In the drawings I have shown my invention as applied to a hydraulic riveting-machine; but it will be understood by those skilled in the art that with like advantages it may be applied to hydraulic machines for pressing, punching, &c. Difficulty has been experienced in using such machine upon work of different thicknesses requiring different initial adjustments of the working tool. Where the work is changed from one piece of metal to a thinner piece, the initial motion of the tool prior to its engagement with the work becomes longer, and as the initial motion is effected at relatively low pressure it follows that unless special adjusting devices be provided the high pressure will be exerted upon the tool prematurely and before it has engaged the piece to be operated upon. The adjusting devices heretofore provided to remedy this difficulty have required skill on the part of the operator, and as the machines are often used by ignorant and unskilled workmen injury is apt to result unless the parts are made of undue size and weight.

The purpose of my invention is to provide an automatically-acting device by which without any skill or care on the part of the workman the initial adjustment of the machine is effected automatically, no matter what may be the variation in the work to be performed.

My invention consists in employing with the fluid-intensifying piston a second piston of larger area moving automatically therewith, by which the initial motion of the tool is effected, a yielding displacement-chamber which after the tool has reached the limit of its adjusting stroke will automatically permit the displacement of the fluid by the larger piston. The larger piston is so arranged that it will effect the necessary initial motion of the tool to any extent desired before the intensifying-piston begins to operate, and after the tool has reached the limit of its initial adjustment the displacement-chamber begins to act as above stated.

More generically, my invention consists in the combination, with the intensifying-piston and a piston of larger area, of a yielding part backed by yielding pressure greater than the pressure required for the initial adjusting stroke of the plunger and adapted automatically to permit advance of the intensifying-piston after the working plunger has reached the end of its adjusting stroke. The said yielding part closes the mouth of a chamber or space capable of receiving the fluid displaced after the working plunger has reached the end of its adjusting stroke.

The power by which the machine is operated may be hydraulic or pneumatic power or it may be applied directly by a mechanical motor. I show the latter connection in Fig. 1, in which the power is derived from a crank 2 and pitman 3, connected with a piston 4, which operates within a cylinder 5, charged with oil or other liquid and connected by way of a cylinder 6 and passage 7 with the working cylinder 8, whose plunger 9 carries the riveting-tool 10 and may be provided with a retracting-spring 11, although this spring may be dispensed with, as shown in Fig. 2, and the piston 9 retracted by suction, as explained below.

12 is an intensifying-piston of smaller cross-sectional area than the piston 4, with which it is connected and with which it moves. It is adapted to enter and move within the cylinder 6. The piston 4 is hollow, and its interior B constitutes the displacement-chamber. At its inner end it has a movable head 13, which is fitted around the piston 12 and is backed by spring 14. Its forward motion is limited by a stop 15 at the end of the chamber B.

In the operation of the device the metal to be riveted or otherwise worked is placed between the tool 10 and its companion tool 10′, and the crank 2 is then set in motion. This projects the piston 4, which displaces the liquid from the cylinder 5, through the cylinder 6 and passage 7, and projects the plunger 9 until the tool 10 comes into contact with the work, which stops the forward advance of the plunger. During the further motion of the piston 4 the liquid displaced thereby will move back the yielding head 13 against the spring 14 within the displacement-chamber B. When the intensifying-plunger 12 enters the cylinder 6, pressure is exerted upon the plunger 9 and tool 10 and the work of riveting or punching is performed. When the piston 4 is retracted, the head 13 will be advanced by the spring 14, and as the piston 12 is drawn out of the cylinder 6 the suction created by said piston and during the latter part of the stroke by the piston 4 will retract the plunger 9 to its initial position even if the spring 11 is not employed. The spring 14 should be strong enough to prevent the head 13 from yielding until it encounters the resistance occasioned by the engagement of the tool 10 with the work. This spring should therefore be stronger than the spring 11. It may be replaced by connecting the chamber back of the head 13 with a source of compressed air. It will thus be seen that the displacement-chamber B, in combination with the piston 4, provides for the initial adjustment of the tool and brings it into contact with the work under the relatively low pressure exerted by the piston 4, no matter what may be the thickness of the piece to be operated upon, and that the intensifying-piston at the beginning of its working stroke finds the tool in contact with the work, so that there is no idle motion under the high pressure developed by the intensifying-piston. The action is entirely automatic, being effected and controlled by the driving mechanism of the machine.

In Fig. 2 I show a modified construction in which the piston 4′ is moved by hydraulic or pneumatic power supplied from a valve-chamber 16 and controlled by a valve 17. I also show a further modification in that the displacement-chamber B′ is not within the piston 4, but is at the side of the cylinder 5′ and is connected therewith by a port 18. It has a movable head 13′, backed by a spring 14′. The operation is the same as described with reference to Fig. 1. The head 13′ yields rearwardly during the advance of the piston 4′ after the tool has engaged the work and in its forward motion is stopped by the wall of the cylinder 5′.

In the modification shown in Fig. 3 the construction is the same as that of Fig. 2, except that the displacement-chamber B is within the hollow piston 4ª, as in Fig. 1.

In Fig. 4 the construction is the same as in Fig. 3, except that the displacement-chamber B is formed within the cylinder 5′ around the cylinder 6 and the yielding head 13ª is an annular head fitted around the cylinder 6 and backed by a spring 14ª. Its rearward motion is limited by a stop 15′.

Other modifications of my invention will suggest themselves to those skilled in the art. Its advantages consist in its automatic adjustment, effected simply by application of motive power controlled by a single valve. The compact nature of the mechanism renders it peculiarly suitable for portable machines. The great length of the low-pressure adjustment-stroke, which is rendered possible by simple proportioning of the diameters of the pistons, permits a large clearance of the tool, which is an advantage in punching or riveting angles, &c., and its construction enables it to be applied easily with any kind of motive power, whether mechanical, hydraulic, or pneumatic.

I claim—

1. In combination with a working plunger, a fluid-intensifier having an intensifying-piston, a second piston of larger area moving with the intensifying-piston for effecting automatically an initial adjusting stroke of the working plunger, and a yielding displacement-chamber adapted to permit displacement of the fluid by the larger piston after the working plunger has reached the end of its adjusting stroke; substantially as described.

2. In combination with a working plunger, a fluid-intensifier having an intensifying-piston, a second piston of larger area connected to and moving with the intensifying-piston for effecting automatically an initial adjusting stroke of the working plunger, and a yielding displacement-chamber adapted to permit displacement of the fluid by the larger piston after the working plunger has reached the end of its adjusting stroke; substantially as described.

3. In combination with a working plunger, a fluid-intensifier having an intensifying-piston, a second piston of larger area moving with the intensifying-piston for effecting automatically an initial adjusting stroke of the working plunger, and a yielding displacement-chamber adapted to permit displacement of the fluid by the larger piston after the working plunger has reached the end of its adjusting stroke, said displacement-chamber having a movable head backed by yielding pressure greater than the pressure required for the initial adjusting stroke of the plunger; substantially as described.

4. In combination with a working plunger, a fluid-intensifier having an intensifying-piston, a second piston of larger area moving with the intensifying-piston for effecting automatically an initial adjusting stroke of the

working plunger, a yielding part backed by yielding pressure greater than the pressure required for the initial adjusting stroke of the plunger and adapted automatically to permit advance of the intensifying-piston after the working plunger has reached the end of its adjusting stroke, said yielding part closing the mouth of a space capable of receiving the fluid thereafter displaced; substantially as described.

In testimony whereof I have hereunto set my hand.

CHESTER B. ALBREE.

Witnesses:

THOMAS W. BAKEWELL,

H. M. CORWIN.