(No Model.)

C. H. JOHNSON.

FLUID PRESSURE MACHINE.

No. 592,115. Patented Oct. 19, 1897.

Fig. 1.

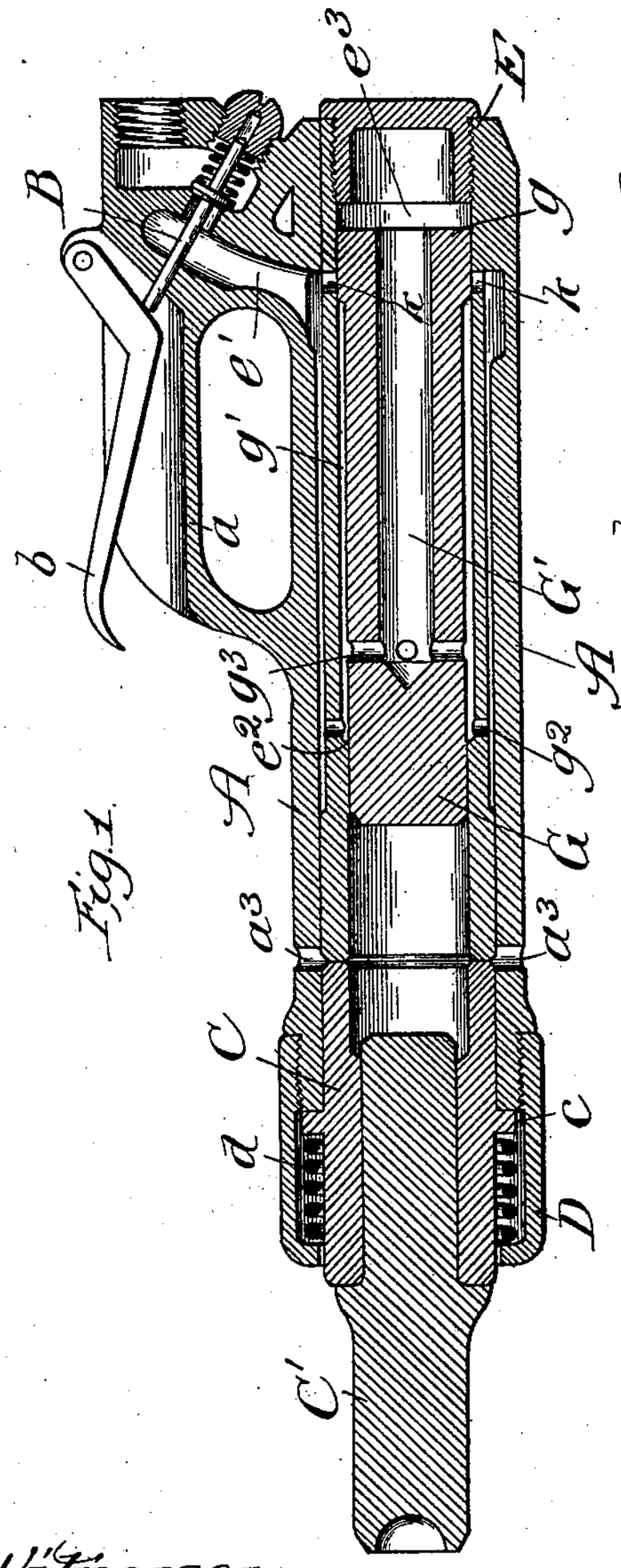
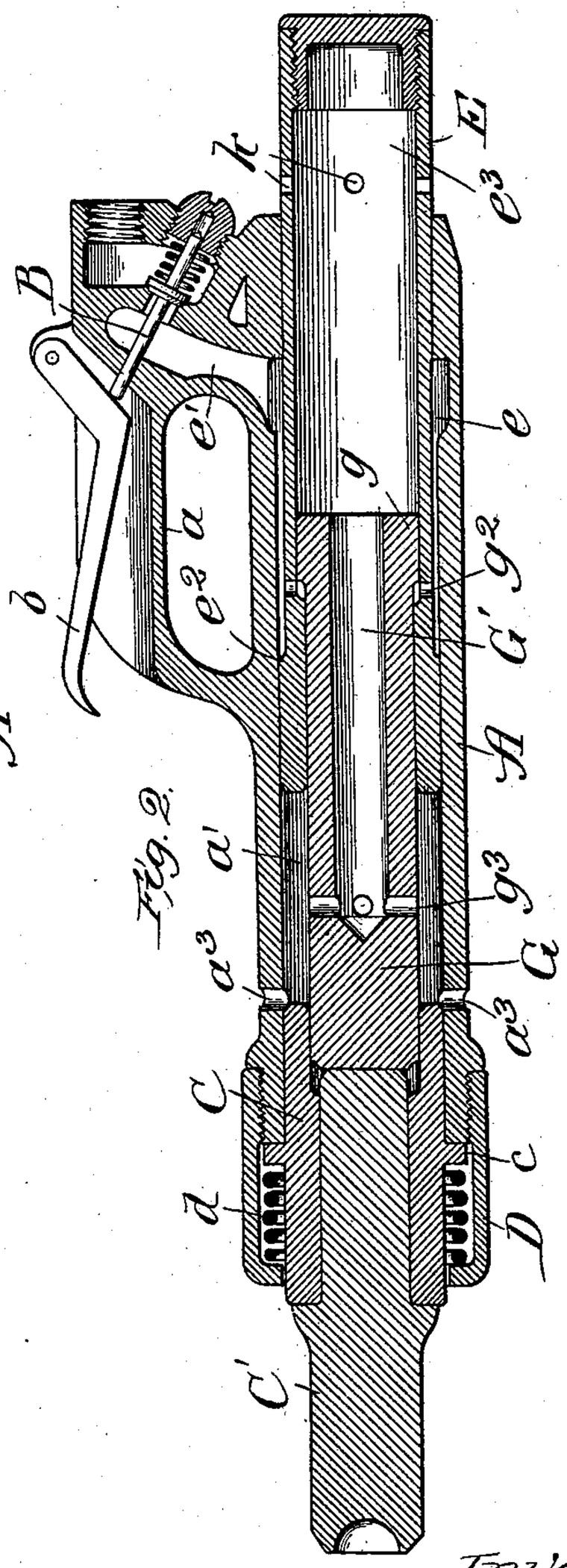


Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES H. JOHNSON, OF SPRINGFIELD, ILLINOIS, ASSIGNOR OF ONE-HALF TO WILLIAM BARRET RIDGELY, OF SAME PLACE.

FLUID-PRESSURE MACHINE.

SPECIFICATION forming part of Letters Patent No. 592,115, dated October 19, 1897.

Application filed December 5, 1896. Serial No. 614,559. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. JOHNSON, a citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Fluid-Pressure Machines, of which the following is a specification.

My invention relates particularly to machines adapted to be operated by fluid-pressure, and especially that class of machines that are known in the art as "portable pneumatic hammers."

The object of my invention is to provide a simple, economical, and efficient fluid-pressure machine, one that is particularly adapted to absorb or prevent shock and vibration incident to the use thereof.

The invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a central longitudinal sectional elevation of a pneumatic hammer fitted with my improvements and with the movable parts arranged at one limit of their motion, and Fig. 2 is a similar view of the movable parts arranged at the opposite limit of their motion.

In the art to which this specific invention relates, and in fact in the art generally, it is well known that where a reciprocating piston is used there is more or less jar incident to the sudden stoppage of the parts before the piston starts on its opposite movement. This objection is greater in the art of pneumatic hammers for the reason that when the piston-hammer strikes the tool it creates a recoil and a still greater recoil as it is driven back to its outer limit of movement. Even when a cushion is employed to absorb the shock due to the backward movement of the piston-hammer the tendency of the tool to leave the work is such as to make the operation of the tool uncertain. Especially is this true when tools of this class are fitted for the operation of riveting. In order to overcome this objection, various tools have been devised having counterpoises and balances and made so heavy as to be no longer portable in the true sense of the word. To overcome these objections and provide a tool of such construction that it will automatically establish a balance or equipoise between the parts and prevent or absorb shocks or jars is the principal object of my invention.

In describing and illustrating my improvements I prefer to describe and illustrate them in connection with what is known as a "portable pneumatic hammer." I do this for the sake of brevity and clearness, but I wish it distinctly understood that I do not desire to be limited strictly to this class of mechanisms, as my improvements are capable of being adapted and used in various other mechanisms by slight modifications and arrangements of parts which the skilled mechanic is capable of performing and without departing from the spirit of the invention.

In constructing a pneumatic hammer in accordance with my improvements I make what I term a "cylindrical casing" A of the desired size, shape, and strength to hold the operative mechanisms. This casing is preferably provided with a handle portion *a*, that carries the inlet-valve B and operating-lever *b*. The casing portion is further provided with a cylindrical chamber *a'*, in which is mounted at one end a cylindrical holder C, that carries the operating-tool C'—in this instance a rivet-holder. The tool-holder is provided with an annular flange *c*, that abuts against the end of the casing proper and is held in place by means of a cap D and a helical spring *d*, which is inserted between the cap and the annular shoulder, the helical spring acting to permit of a movement of the holder when occasion requires.

To operate on the tool and maintain balance of the parts or prevent shock or jar, I make what I term a "reciprocating cylinder" E and mount it in a cylindrical chamber of the casing. The reciprocating cylinder and the casing are so arranged and constructed as to provide an annular chamber *e* between such parts, such annular chamber being preferably at all times in communication with the inlet-passage *e'*, that leads from the inlet-valve. Mounted in the reciprocating cylinder is a piston-hammer G, provided at one end with a head portion *g* and so arranged as to provide an annular chamber *g'* between it and the auxiliary reciprocating cylinder. The aux-

iliary reciprocating cylinder is provided with passages that afford communication between the chambers *e* and *g'*, so that fluid-pressure at the proper time may pass from the source of the fluid-pressure supply to the interior annular chamber.

In order to operate the piston-hammer in one of its directions and the reciprocating cylinder in the opposite direction, I provide the piston-hammer with a longitudinal passage or opening G', which opens into a space at one end between it and the extreme end of the reciprocating cylinder, and at or near the other end is provided transverse passages g^3, that allow it to alternately communicate with the annular chamber *g'* and the casing-chamber *a'*. The casing-chamber *a'* is provided with exhaust-passages a^3, through which the fluid-pressure is ultimately exhausted into the open air.

Having thus described the construction of parts, I will now proceed to describe the operation of the mechanism. Assuming the parts to be in the position shown in Fig. 2, the lever *b* is depressed, the inlet-valve open, and fluid-pressure flows into the annular chamber *e*, acts on the forward part of the shoulder e^2 of the reciprocating cylinder and forces it inward to the position shown in Fig. 1, so as to contact the tool-holder and deliver thereby a blow on the tool. At the same time a certain amount of pressure flows through the passages g^2 into the inner annular chamber and acts against the head *g* of the piston-hammer to force the same back to the position shown in Fig. 1. This equalizes in a measure the blow delivered on the tool and each acts to balance the other movement, so that there is very little tendency to recoil. The fluid-pressure then passes in through the passages g^3 and G' into the chamber e^3 of the reciprocating cylinder between the end of the reciprocating cylinder and the piston-hammer, so that it may act in an expansive manner upon a larger area and against the direct pressure of the smaller surface and force the piston-hammer in, as shown in Fig. 2, to deliver a blow direct to the tool. At the same time the fluid-pressure acts to force the reciprocating cylinder outwardly or backwardly to the position shown in Fig. 2, which serves to act as a balance to the inward thrust and prevent or minimize the recoil. These operations are repeated and continued as often as desired and as rapidly as desired, due to the amount of and length of time that fluid-pressure is furnished. The reciprocating cylinder may be provided with a second set of transverse openings K, which act to more quickly exhaust the pressure, and permit the reverse movement of the piston to take place with greater rapidity.

The principal advantage due to my improvement is that I provide a tool of minimum lightness, containing only enough of metal to withstand the strains incident to use and which minimizes the amount of shock, jar, and recoil due to the use of this class of tools.

While I have described my invention with more or less minuteness as regards details and as being embodied in certain precise forms and as available to certain specified means, I do not desire to be limited thereto unduly or any more than is pointed out in the claims. On the contrary, I contemplate all proper uses, changes in form, construction and arrangement, the omission of immaterial elements, and the substitution of equivalents, as circumstances may suggest or necessity render expedient.

I claim—

1. In mechanisms of the class described, the combination of a casing provided with a cylindrical chamber, a reciprocating cylinder mounted therein having one end closed and providing an annular fluid-pressure chamber between it and the casing to drive it in one direction, and a reciprocating piston mounted in the open end of said cylinder so as to provide a second annular pressure-chamber between it and the cylinder and provided with a longitudinal passage therethrough to furnish communication with the annular chamber and the space between the inner end of the piston and cylinder so as to furnish fluid-pressure to drive the piston in one and the cylinder in an opposite direction, substantially as described.

2. In mechanisms of the class described, the combination of a casing provided with a longitudinal cylindrical chamber, a cylindrical tool-holder yieldingly mounted in one end of the casing, a tool in said holder, a reciprocating cylinder mounted in the casing so as to contact the tool-holder at one limit of its motion, a piston-hammer reciprocatingly mounted in the cylinder and arranged to contact the tool at one limit of its motion and means for furnishing fluid-pressure to the parts so as to operate the same and alternately drive them so as to contact the tool-holder and the tool alternately, substantially as described.

3. In mechanisms of the class described, the combination of a casing provided with a longitudinal cylindrical chamber, a cylindrical tool-holder yieldingly mounted in said chamber at one end of the casing, a tool in said tool-holder, a reciprocating cylinder mounted in the chamber of the casing and arranged to contact such tool-holder at one limit of its motion and providing an annular fluid-pressure chamber between it and the casing, a piston-hammer reciprocatingly mounted in said cylinder arranged to contact the tool at one limit of its motion providing between it and the cylinder an annular pressure-chamber and provided with a longitudinal opening or passage to alternately admit the exhaust fluid-pressure between the end of the piston and the end of the cylinder to assist the reciprocation of the parts, and means for furnishing fluid-pressure so as to operate the

parts to contact the tool and holder alternately, substantially as described.

4. In mechanisms of the class described, the combination of a casing provided with a cylindrical chamber, a reciprocating cylinder mounted therein having one end closed and provided with an annular fluid-pressure chamber between it and the casing to drive it in one direction, and with pressure-inlet openings g^2 at one end and exhaust-openings K at or near the opposite end, and a reciprocating piston mounted in the open end of said cylinder so as to provide a second annular pressure-chamber between it and the cylinder and connected with the inlet-opening g^2 and providing a second pressure-chamber between it and the cylinder and provided with a longitudinal passage through the piston to furnish communication with the annular chamber and space between the inner end of the piston and the closed end of the cylinder with the exhaust-openings near the forward end of the piston, substantially as described.

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