

No. 825,301.

PATENTED JULY 10, 1906.

E. D. CODDINGTON.
HYDROPNEUMATIC PRESS.
APPLICATION FILED AUG. 5, 1903.

2 SHEETS—SHEET 1.

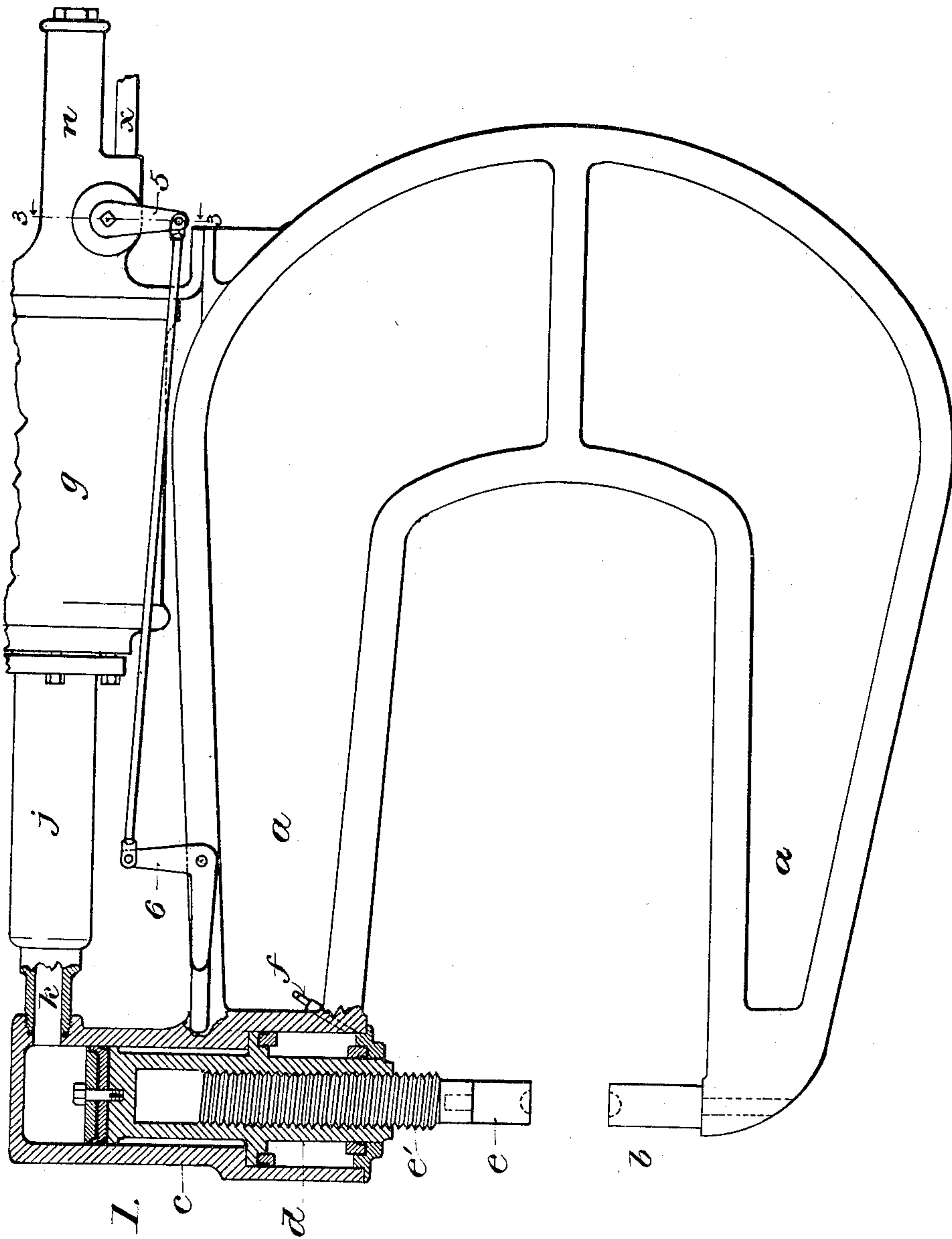


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

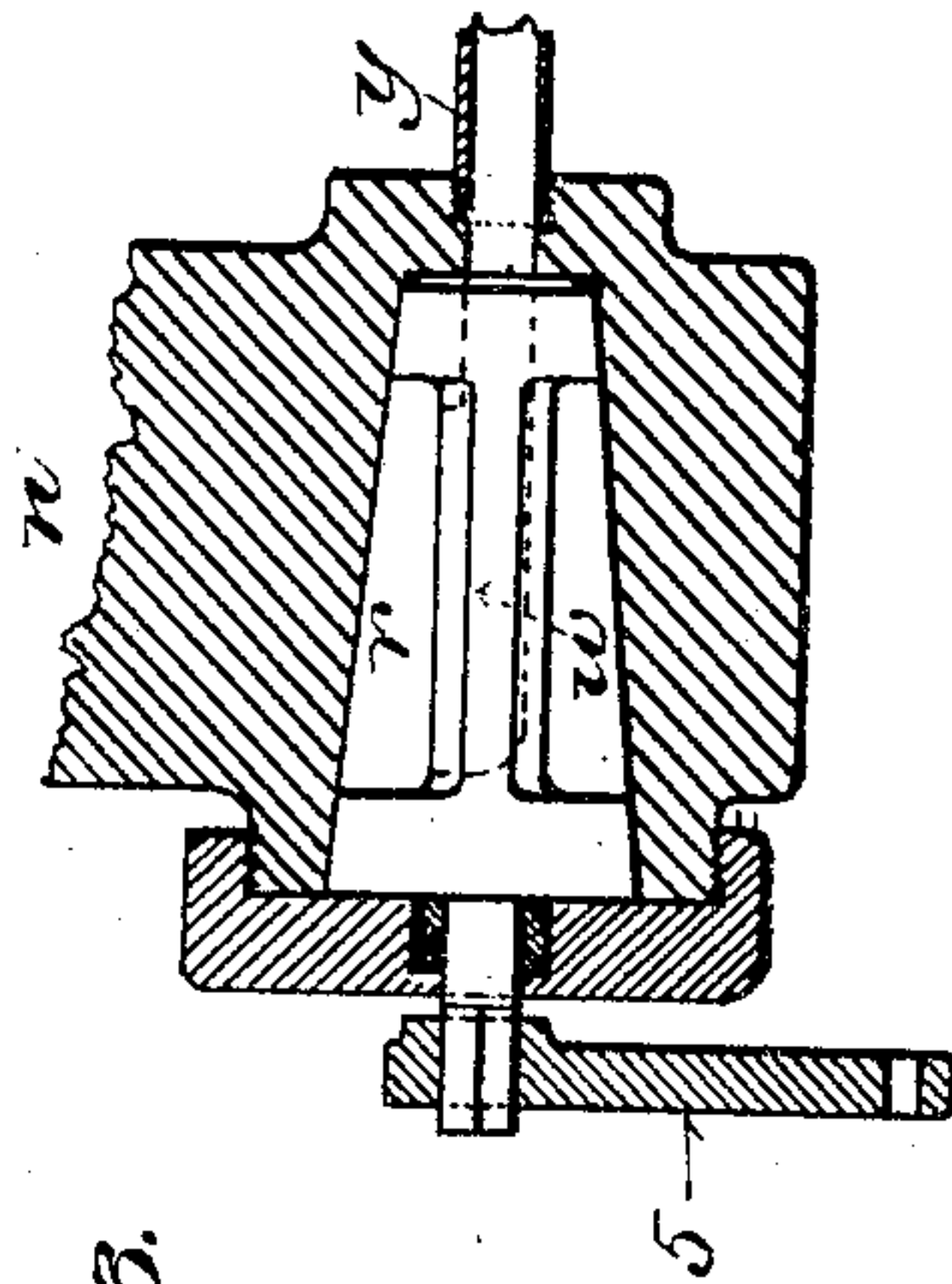
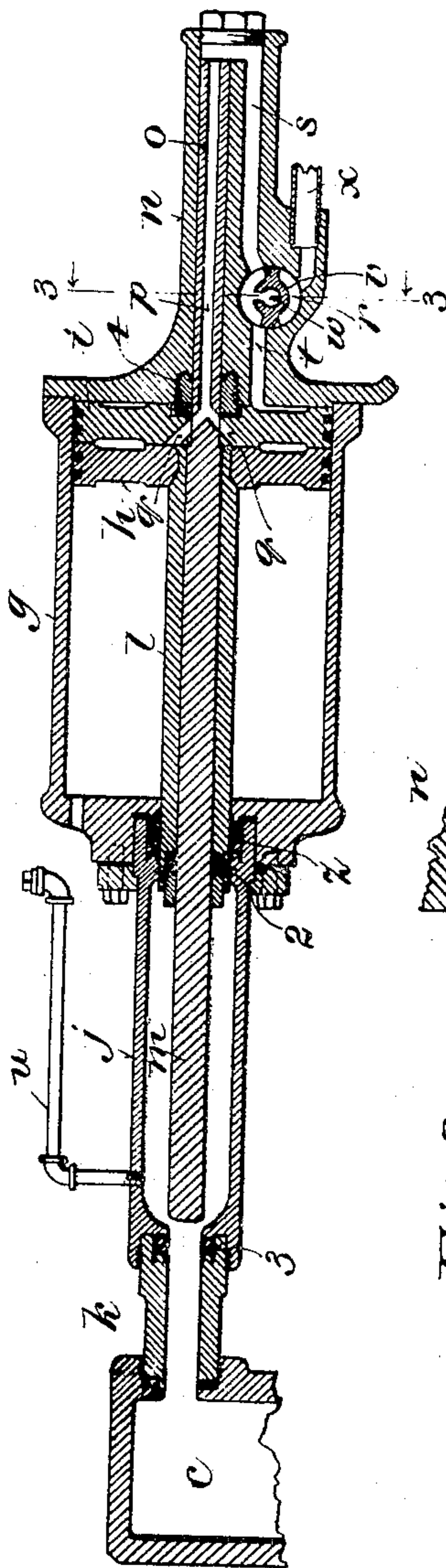


Fig. 3.

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UNITED STATES PATENT OFFICE.

EDWIN D. CODDINGTON, OF NORTH MILWAUKEE, WISCONSIN.

HYDROPNEUMATIC PRESS.

No. 825,301.

Specification of Letters Patent.

Patented July 10, 1906.

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To all whom it may concern:

Be it known that I, EDWIN D. CODDINGTON, a citizen of the United States, residing at North Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Hydropneumatic Presses, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to machines in which a ram or plunger is operated by an elastic fluid through the medium of an inelastic fluid and the pressure is augmented at the end or any part of the working stroke of said ram or plunger by an auxiliary plunger or intensifier of comparatively small area.

The main object of the invention is to simplify and improve the construction and operation of machines of this class.

It consists in certain novel features of construction and in the peculiar arrangement and combinations of parts, as hereinafter particularly described, and pointed out in the claims.

For the purpose of illustration I have shown a riveting press or machine embodying the invention, which, however, is applicable with little or no change to other purposes.

In the accompanying drawings like characters designate the same parts in the several figures.

Figure 1 is a view, partly in side elevation and partly in vertical longitudinal section, of the machine. Fig. 2 is an axial section of the mechanism for operating the ram or plunger which carries the movable die; and Fig. 3 is an enlarged cross-section on the line 3-3, Figs. 1 and 2, showing the controlling-valve of the motor which operates the movable die or ram.

Referring to Fig. 1 of the accompanying drawings, the frame of the machine is formed with two opposing jaws *a a*, one of which carries the fixed die *b*, the other being formed or provided with a cylinder *c* opposite and in line with the fixed die. In this cylinder a ram or plunger *d* is fitted to work, and to this ram the movable die *e* is adjustably attached by a screw *e'*. The cylinder and ram are preferably of the differential type, with one end of each nearest the die of larger diameter than the other end. For withdrawing the ram and movable die away from the fixed die a compressed-air or other fluid supply

connection *f* is made with the larger end of the cylinder *c*. To force the ram *d* toward the fixed die and to produce the working stroke of the movable die, a cylinder *g*, having two independently-movable pistons *h* and *i*, is provided. This cylinder has at one end an extension consisting of two tubular parts *j* and *k* of larger and smaller bores or diameters, respectively. Referring to Figs. 2 and 3 in connection with Fig. 1, the parts of this extension are arranged coaxially with each other and with the cylinder *g* and normally communicate with each other at their adjoining ends. The other end of the smaller part *k* communicates with the smaller end of the cylinder *c*. The piston *h* has a tubular plunger *l*, which extends into and works freely in the larger part *j* of said extension, and the piston *i* has a plunger *m*, which is fitted to work in the tubular plunger *l* and normally projects through it into said part *j* and is adapted to work in the smaller part *k* of said extension. The head of the cylinder *g* opposite the extension *j k* is formed with an extension *n*, having a bore in line with the axis of the cylinder, and the piston *i* has a tubular stem *o*, which is fitted in said bore and may be formed, as shown, integral with the plunger *m*. The passage *p* in the stem *o* communicates at its inner end through lateral openings or branches *q* with the space between the two pistons *h* and *i*. The extension *n* is also formed with a valve-chamber *r*, communicating through a passage *s* with the outer end of the bore in which the tubular stem *o* works and through a passage *t* with the space between the adjacent cylinder-head and the piston *i*. A rotary valve *v*, formed with an axial exhaust-passage *w*, is fitted in said chamber. A pipe or passage *x* connects said chamber with a source of compressed air or other fluid under pressure, and an exhaust-pipe *y*, attached to the extension *n*, as shown in Fig. 3, communicates with the exhaust-passage *w* in said valve. At its end opposite the exhaust-pipe the valve has a stem which projects through a stuffing-box and is provided with an arm 5. This arm is connected with a hand-lever 6 near the dies, as shown in Fig. 1, or any other suitable connection for operating said valve may be employed. Between the cylinder *g* and its extension *j k* suitable packing *z* is provided around the tubular plunger *l*. Packing 2 is also provided in the outer end of the tubular plunger *l* around the plunger *m*. Between the parts *j*

and *k* of the cylinder extension packing 3 is provided to prevent leakage back from part *k* into part *j* when the plunger *m* is advanced, and packing 4 is provided in the opposite cylinder-head around the tubular stem *o*. The extension *j k* is filled, by means of a pipe *u*, with oil or other inelastic fluid when the plunger *d* is in its upper position, as shown in Fig. 1, and the pistons *h* and *i*, with their plungers *l* and *m*, are in their initial positions, as shown in Fig. 2, and said plungers are so proportioned that when advanced into said cylinder extension *j k* their displacement of the oil or other liquid contained therein will before the plunger *m* reaches the limit of its advance movement fill the smaller end of the cylinder *c* normally occupied by the ram *d*, and thereby force said ram to the full extent of its movement toward the fixed die *b*.

The machine hereinbefore described operates as follows: The pistons *h* and *i*, the intensifier-plungers *l* and *m*, and the valve *v* normally occupy the positions in which they are shown in the drawings, and the ram *b* is forced back into and held in the smaller end of cylinder *c* by the constant admission of compressed air or other fluid under pressure into the larger end of said cylinder *c* through the connection *f*. The work being placed between the jaws *a* of the frame with the rivet to be upset in line with the dies *b* and *e*, the valve *v* is first turned to the left, thereby establishing communication between the passage *s* and the supply-passage *x*. Compressed air or other fluid under pressure is thereby admitted through said passages and the passage *p* into the space between the pistons *h* and *i*. The piston *i* remaining stationary, the piston *h* is advanced or moved to the left with the tubular or larger intensifier-plunger *l*, which displaces the oil or other liquid in the larger part *j* of the cylinder extension and forces said liquid therefrom into the cylinder *c*, thereby quickly moving the ram *b*, with the die *e*, against the rivet and partially upsetting the same. The valve *v* is now turned back to the right sufficiently to connect the passage *s* with the exhaust-passage *w* and pipe *y* and the passage *t* with the supply-passage *x*. The piston *i* is thereupon advanced or moved with the smaller intensifier-plunger *m* to the left, the air or other fluid between the two pistons escaping through the passages *p*, *s*, and *w*. As the plunger *m* enters the bore of the smaller part *k* of the cylinder extension the liquid contained therein is prevented by the packing 3 from escaping into the larger part *j* of said cylinder extension, and as said plunger *m* advances, displacing the liquid in said part *k* and forcing it into the smaller end of said cylinder *c*, the ram *d*, with the die *e*, is advanced with great force against the rivet supported by the die *b*, thereby completely upsetting and forming a head on said rivet. The valve

v is now turned back to its original position, as shown in Figs. 1 and 2, permitting the compressed air or other actuating fluid to escape from the cylinder *g* through the passages *t* and *w*, and also, if necessary, through the passages *p*, *s*, and *w*; communication between said passages and the supply-passage *x* being cut off in this position of the valve. The compressed air or other fluid under pressure constantly admitted through the connection *f* to the larger end of the cylinder *c* thereupon forces the ram *d* back to its original position in the smaller end of said cylinder, displacing the liquid therein and forcing it back into the cylinder extension *j k*. The liquid thus forced from the cylinder *c* by the ram *d* reacts first on the plunger *m* and then on the plunger *l* to return the pistons *i* and *h*, with said plungers, to their original positions, as shown in the drawings. The machine is now ready for operation upon another rivet.

Various modifications in the minor details of construction and arrangement of parts may be made without materially affecting the operation of the machine and within the principle and intended scope of my invention.

I claim—

1. In a hydropneumatic press the combination with a ram and a cylinder therefor, of a cylinder provided with two independently-movable pistons, and with a tubular extension having larger and smaller bores, and plungers attached to said pistons and fitted one within the other to work in the smaller and larger bores respectively of said cylinder extension, substantially as described.

2. In a hydropneumatic press the combination with a ram and a cylinder therefor of coaxial chambers of larger and smaller diameter communicating with each other and through the smaller chamber with said cylinder, a cylinder provided with two independently-movable pistons and with fluid supply and exhaust connections and passages leading therefrom to the space between the two pistons and the space between one of said pistons and the adjacent cylinder-head, a valve controlling said passages, and plungers fitted one within the other to work in said chambers and attached to said pistons, substantially as described.

3. In a hydropneumatic press the combination with a ram and a cylinder therefor, of a cylinder provided with two independently-movable pistons and at the ends with tubular extensions one of which has a larger and a smaller bore communicating with the ram-cylinder, a tubular plunger attached to one piston and fitted to work in the larger bore, a smaller plunger attached to the other piston and fitted to work through the tubular plunger into the smaller bore of one cylinder extension, the last-named piston having a tubular stem fitted in the other cylinder extension and communicating with the space between

said pistons, and valve-controlled fluid supply and exhaust connections communicating with said tubular stem and with the space between one piston and the adjacent cylinder-head, substantially as described.

4. In a hydropneumatic press the combination with a differential ram and cylinder therefor having a fluid-supply connection at the larger end, of a cylinder provided with two independently-movable pistons and with an extension having larger and smaller bores connected with the smaller end of the ram-cylinder, plungers attached to said pistons and adapted to work one within the other in the smaller and larger bores respectively of said cylinder extension, and means for admitting and releasing an actuating fluid to and from the space between said pistons and the space between one of them and the adjacent cylinder-head, substantially as described.

5. In a hydropneumatic press the combination with a ram and a cylinder therefor, of

a cylinder provided with two independently-movable pistons and with an extension having larger and smaller bores communicating through the smaller bore with the ram-cylinder, a tubular plunger attached to one piston and fitted to work in the larger bore, and a longer plunger of smaller diameter attached to the other piston and fitted to work through the tubular plunger into the smaller bore of said cylinder extension, which is provided between its larger and smaller bores with packing fitting the smaller plunger and between its larger bore and the piston-cylinder with packing fitting the larger plunger, which is in turn provided with packing fitting the smaller plunger, substantially as described.

In witness whereof I hereto affix my signature in presence of two witnesses.

EDWIN D. CODDINGTON.

Witnesses:

MAUDE L. EMERY,
CHAS. L. GOSS.