O. S. BEYER.

DRAWING PRESS.

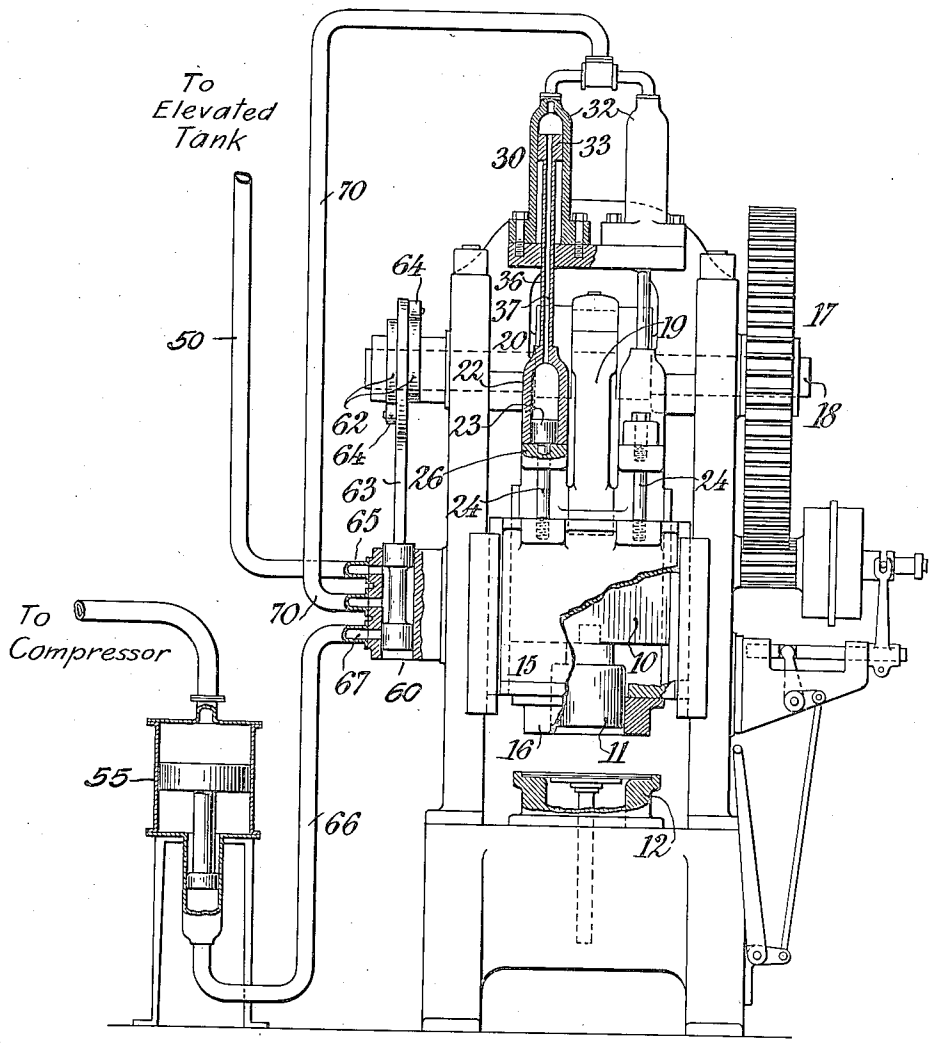
APPLICATION FILED MAY 20, 1921.

1,433,116.

Patented Oct. 24, 1922.

4 SHEETS—SHEET 1.

Fig. 1.



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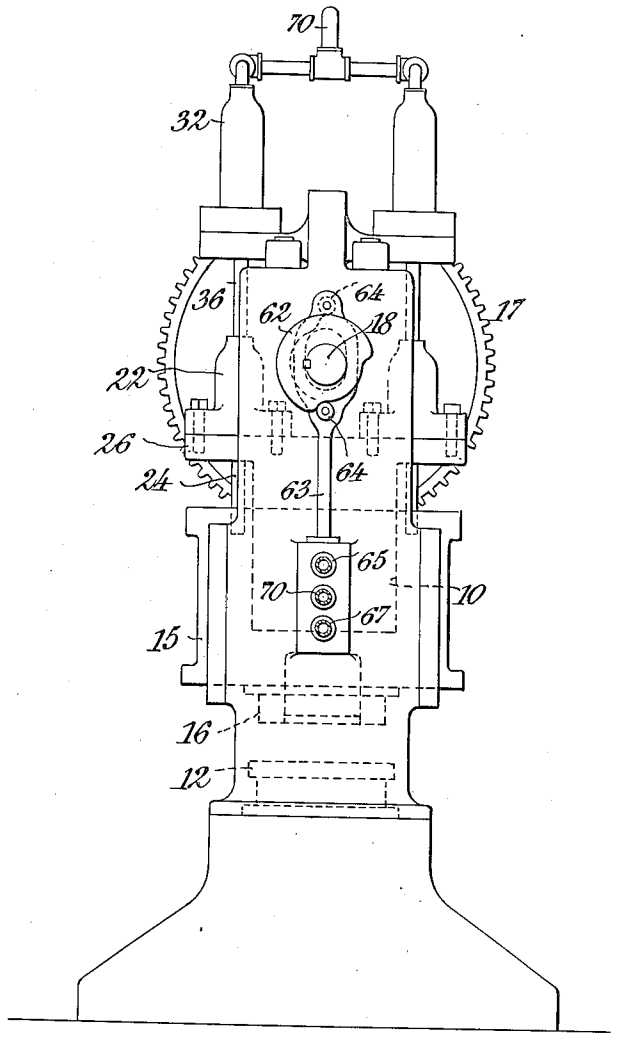
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4 SHEETS—SHEET 2.

Fig. 2.



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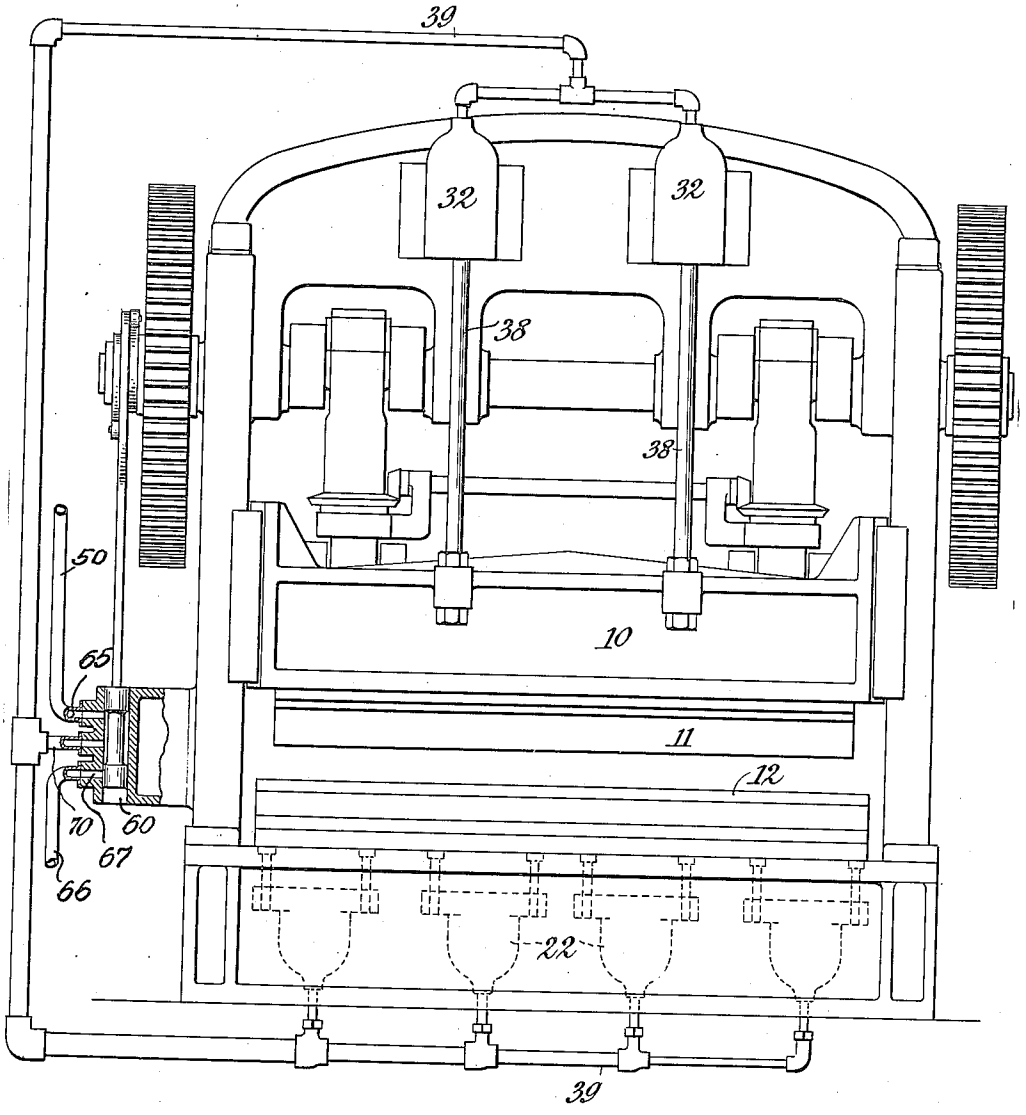
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4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 4

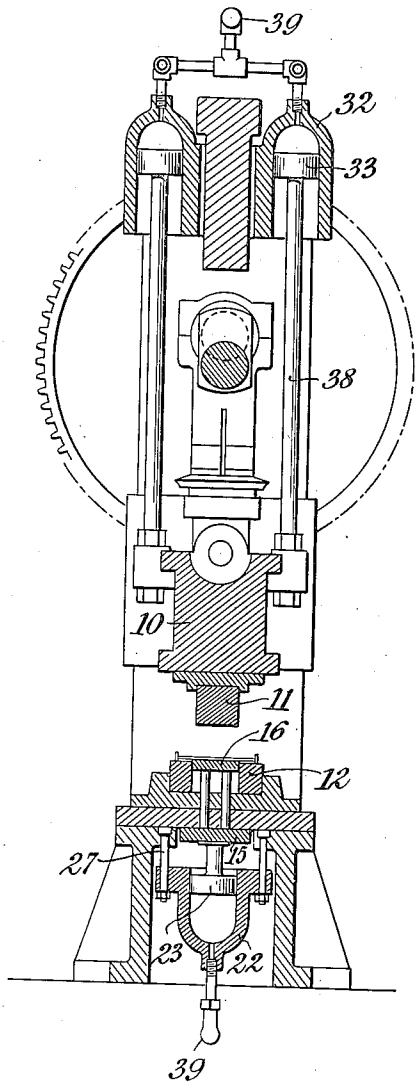
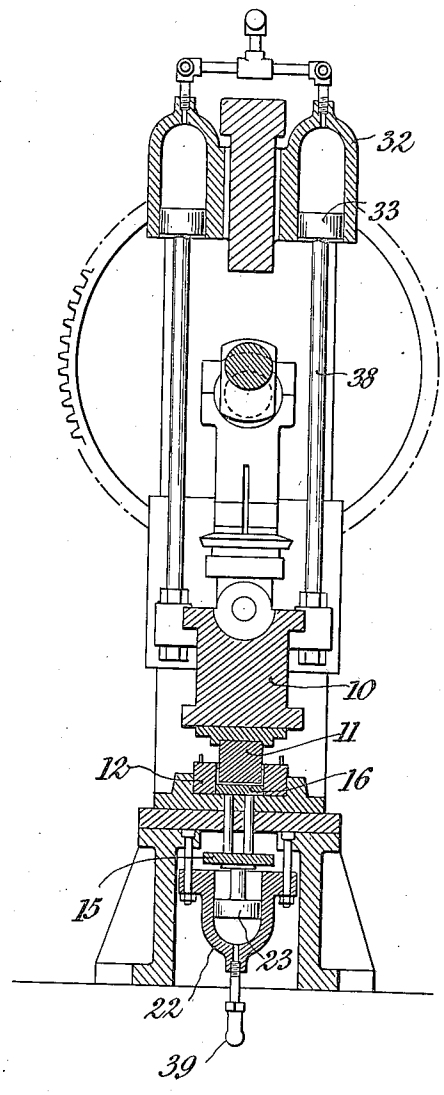


Fig. 5.



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UNITED STATES PATENT OFFICE.

OTTO S. BEYER, OF BROOKLYN, NEW YORK, ASSIGNOR TO E. W. BLISS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

DRAWING PRESS.

Application filed May 20, 1921. Serial No. 471,183.

To all whom it may concern:

Be it known that I, OTTO S. BEYER, a citizen of the United States of America, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Drawing Presses, of which the following is a specification.

This invention relates to drawing presses, and aims to provide improvements therein.

The invention provides a construction wherein an ordinary (single acting) press may be readily converted into a drawing press, and moreover in a simple manner and at relatively small cost.

The invention further provides a construction wherein the punch-slide driving mechanism (main crank shaft, for example) may coact in actuating the blank-holder slide, and in such manner that the reactions on the blank-holder are not transmitted (or only in small degree) to the punch-slide driving-mechanism.

The invention further provides a construction wherein a relatively even blank-holder pressure on the work may be obtained.

The invention further provides a construction wherein hydraulic pressure may be utilized, in connection with the blank-holder, without the employment of sensitive valves, large pumps, or complicated parts, the mechanism being relatively simple, and, in its preferred embodiment, entailing no appreciable consumption of water or other pressure medium.

Two embodiments of the invention are illustrated in the accompanying drawings, wherein:

Figure 1 is a view, in front elevation, (with parts in section) of one embodiment of the invention, the press shown being an ordinary (single acting) press, converted to an ordinary type (double acting) drawing press.

Fig. 2 is a sectional view of the construction shown in Fig. 1, the section being on the line II—II, Fig. 1.

Fig. 3 is a front elevation of a second embodiment of the invention, the press shown being an ordinary (single acting) press, converted to a type of drawing press commonly known as a rail press.

Figs. 4 and 5 are sectional views, on the line V—V, Fig. 3, and showing the operating parts at opposite limits of their working positions.

Referring to said drawings, numeral 10 designates a punch slide (having a punch 11 thereon), 12 a die or complementary part, and 15 the blank-holder slide (having the blank-holder 16 thereon). In the construction shown in Figs. 1 and 2, the blank-holder slide 15 telescopes the punch slide 10, and the blank-holder 16 thereon acts to press the blank against the die 12 during the action of the punch on the blank, while, in the construction shown in Figs. 3—5, the blank-holder slide is so arranged that the blank-holder 16 thereon acts through the die, and to press the blank against the punch 11, during the action of the punch on the blank.

Suitable driving means 17 are provided for the punch slide, and these means are conveniently in the form of a crank shaft 18, connected to the punch slide by means of a pitman rod 19.

Hydraulic means 20 are provided for actuating the blank-holder slide 15, to press the blank-holder against the blank. This means is conveniently in the form of a cylinder 22, and piston 23, the piston 23 being conveniently attached to the blank-holder slide 15, by means of a rod 24. In the construction shown in Figs. 1 and 2, the cylinder (22) is attached to the punch slide 10, as indicated at 26, and, in the construction shown in Figs. 3—5, the cylinder (22) is connected to the bed of the press, as indicated at 27.

In these embodiments, the punch-slide driving mechanism 17, during the drawing part of the working stroke, will have to move either the cylinder 22 (Figs. 1 and 2) or the piston 23 (Figs. 3—5), and, in order to prevent (or minimize) the hydraulic pressure in said hydraulic means 20, reacting on said punch-slide driving-mechanism during the drawing-part of the working stroke, suitable means 30 are provided. These means are conveniently in the form of a cylinder 32 and piston 33, of which the cylinder 32 is in communication with the first cylinder 22, and one of which parts (32 or 33) is attached to the punch-slide driving-mechanism, conveniently to the punch-slide 10. In the embodiment of Figs. 1 and 2, the connection of the piston 33 to the slide is through a rod 36 connected to the cylinder

22 which is attached to the slide 10, and the communication between the two cylinders 22, 32, in this embodiment, is through a passage 37 in the rod 36. In the embodiment shown in Figs. 3—5, the connection of the piston 33 to the punch-slide 10 is through a rod 38, and the communication between the two cylinders 22, 32, is through a pipe 39.

The cylinders 32 are fastened to the frame of the press, so as to transmit strains to said frame.

Pressure is adapted to be exerted, at an appropriate time or times, to the fluid in the cylinders 22, 32, and the means for exerting the pressure are preferably such as to exert, at certain times, a low pressure, and, at other times, a high pressure. These means are conveniently a liquid column 50, and a compressor 55, preferably mechanical, such as a differential piston, on one side of which a constant pressure of a hydrostatic column or of compressed air, may act.

Any suitable valve or controller 60 may be provided for placing the pressure means 50 and 55 in communication with the cylinders 22 and 32. The controller 60 is preferably actuated by a part of the press, as a cam or pair of cams, 62, on the punch-slide driving-shaft 18, and the shifting-rod 63 actuated by said cam. The shape of the cam is such as to effect the desired operations of the valve or controller 60. Contact with the cam is made by pins or rollers 64 on said shifting-rod 63.

The low pressure means 50 is connected to said valve or controller 60, as indicated at 65, and the high pressure means 55 is connected to said controller through a pipe 66, as indicated at 67, and said cylinder 32 is connected with the valve or controller by a pipe 70, connected directly to the cylinder 32, in the embodiment of Figs. 1 and 2, or to the pipe 39 connecting said cylinders 32 and 22, in the embodiment of Figs. 3—5, and said valve or controller is adapted to connect said pipe 70 to the high pressure means 55, and to the low pressure means 50, at proper time.

One or more sets of the cylinders 22, 32 (and pistons 23, 33) are used, according to requirements, and these are usually arranged symmetrical to one or both of the mid-planes of the press. The areas of the pistons 23 and 33 are also most conveniently equal, for reasons hereinafter explained.

Operation.—The punch slide 10 being in the top-stroke position (Figs. 1 and 4), the valve or other controller 60 is in position to admit water or other fluid from the low pressure means 50 to the cylinders 32, 22 (via pipe 70 and hollow rod 36, in the embodiment of Figs. 1 and 2, and via pipes 70 and 39 in the embodiment of Figs. 3—5). The blank-holder slide 15 is caused to move down with the punch slide 10 (embodiment Figs. 1 and 2), or upward toward the punch (embodiment Figs. 3—5), by the pressure acting on the pistons 23.

When the blank-holder 16 strikes the blank, the controller 60 is actuated by the cam 62 (or other means), to shift the communication of the pipe 70 from the low pressure means 50 to the high pressure means 55. High pressure is thereupon produced in the cylinders 32, 22 (via pipes 70, 39, 37), and the blank-holder 16 is pressed firmly against the blank.

The reaction of the pressure on the punch slide 10 (opposing the force of the punch slide driving means 17) between the cylinder 22 and piston 23, Figs. 1 and 2, and between the piston 23 and the punch 11, Figs. 3—5, is neutralized or diminished (as the case may be) by the piston 33 acting on the cylinder 22, Figs. 1 and 2, or the punch slide 10, Figs. 3—5.

Where the pistons 23, 33 are arranged to have equal movement, the diameters of the cylinders 22, 32 are made equal, so that diminution in the volume of cylinder 22, due to relative movement of the cylinder 22 and piston 23, does not act to further compress the liquid therein, but the liquid is simply shifted or transferred from the cylinder 22 (via 37 or 39) to the cylinder 32, the volume or space in which cylinder increases in proportion as the volume or space in cylinder 22 decreases. The punch-slide driving means 17, therefore, has substantially no resistance of the blank-holder slide hydraulic actuating means to overcome other than that due to friction of the liquid in the pipes or piston in the cylinder, or such as may be due to a determined differential area of the pistons 23, 33. Consequently, the punch slide actuating means, such as a crank-shaft, is practically relieved of the blank-holder reactions or pressures, these being sustained by the frame of the press, and the punch is, therefore, free, on its working stroke, to receive the full effect of the driving force transmitted to the punch slide which carries it.

Moreover, the pressure of the blank-holder is substantially uniform on the blank during the drawing part of the working stroke of the punch.

Where a plurality of cylinders 22 or 32 are employed, the areas and strokes of pistons, in the group or groups, may be varied in any manner, provided one cylinder or group is able substantially to receive the fluid displaced in the other cylinder or group.

When the punch 11 reaches the end of its working stroke, the controller 60 is then actuated to cut off the communication of the cylinders 22, 32 (or a pipe 70) from the high pressure means, and also preferably to again place the cylinders in communication with the low pressure means 50, said means 50, in

the form of a hydrostatic column, serving as a vent for the escape of fluid from the cylinders 22, 32, on the return stroke of the punch slide 10, and consequent return of the blank-holder slide 15.

On the upstroke of the punch slide 10, the blank-holder slide 15 will be lifted by the former, through connection of the piston 23 and cylinder 22, Figs. 1 and 2, and, in the embodiment of Figs. 3—5, the hydrostatic pressure acts to return the blank-holder slide, when this is permitted by the upward movement of the punch.

While a low pressure means 50 and a high pressure means 55 are both preferably used, nevertheless, it is within the idea of the invention to employ a single pressure means.

The inventive ideas herein set forth may receive various other embodiments than those herein specifically illustrated and described.

What is claimed is:

1. A drawing press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, and means venting the first named cylinder to permit movement of the piston therein and at the same time introducing fluid into the other cylinder to maintain a substantial equality of pressures in the two cylinders whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished.

2. A drawing press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, said cylinders being in communication, whereby fluid displaced from one cylinder may flow into the other cylinder.

3. A drawing press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, said cylinders being in communication, whereby fluid displaced from one cylinder may flow into the other cylinder, pressure means for exerting pressure in said cylinders, and a controller for controlling the communication of said pressure means with said cylinders.

4. A drawing press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, said cylinders being in communication, whereby fluid displaced from one cylinder may flow into the other cylinder, said pressure means comprising a low-pressure means and a high-pressure means, and said controller acting to time the communication of said high and low pressure means with said cylinders.

5. A drawing press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, said cylinders being in communication, whereby fluid displaced from one cylinder may flow into the other cylinder, pressure means for exerting pressure in said cylinders, and a controller for controlling the communication of said pressure means with said cylinders, and controller actuating means comprising a part actuated by said press.

6. A drawing press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide

in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, one part of said first-named cylinder and piston being connected to said punch-slide, one part of said second-named cylinder and piston being connected to the press frame, and the other parts of each of said cylinder and piston being connected together.

7. A drawing-press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, one of said first-named cylinder and piston being connected to said punch-slide, one part of said second-named cylinder and piston being connected to said blank-holder slide, and a pipe connecting said cylinders.

8. A drawing-press, comprising a punch-slide, punch-slide driving means, a blank-holder slide, a hydraulic cylinder and piston, one part of which drives said blank-holder slide, and one part of which reacts against said punch-slide driving means, during a part of the movement of said punch-slide, and a hydraulic cylinder and piston operating said punch-slide in a contrary direction to the action of said first-named cylinder and piston, whereby the action of said first-named piston and cylinder, in opposing said punch-slide driving means, is largely diminished, one of said first-named cylinder and piston being connected to said punch-slide, one part of said second-named cylinder and piston being connected to said blank-holder slide, and a pipe connecting said cylinders, said blank-holder-slide being actuated by said punch-slide, through the blank.

In witness whereof, I have hereunto signed my name.

OTTO S. BEYER.