W. KLOCKE & F. ORTON.

HYDROMECHANICAL DRAWING PRESS.

APPLICATION FILED AUG. 17, 1910.

998,968.

Patented July 25, 1911.

3 SHEETS—SHEET 1.

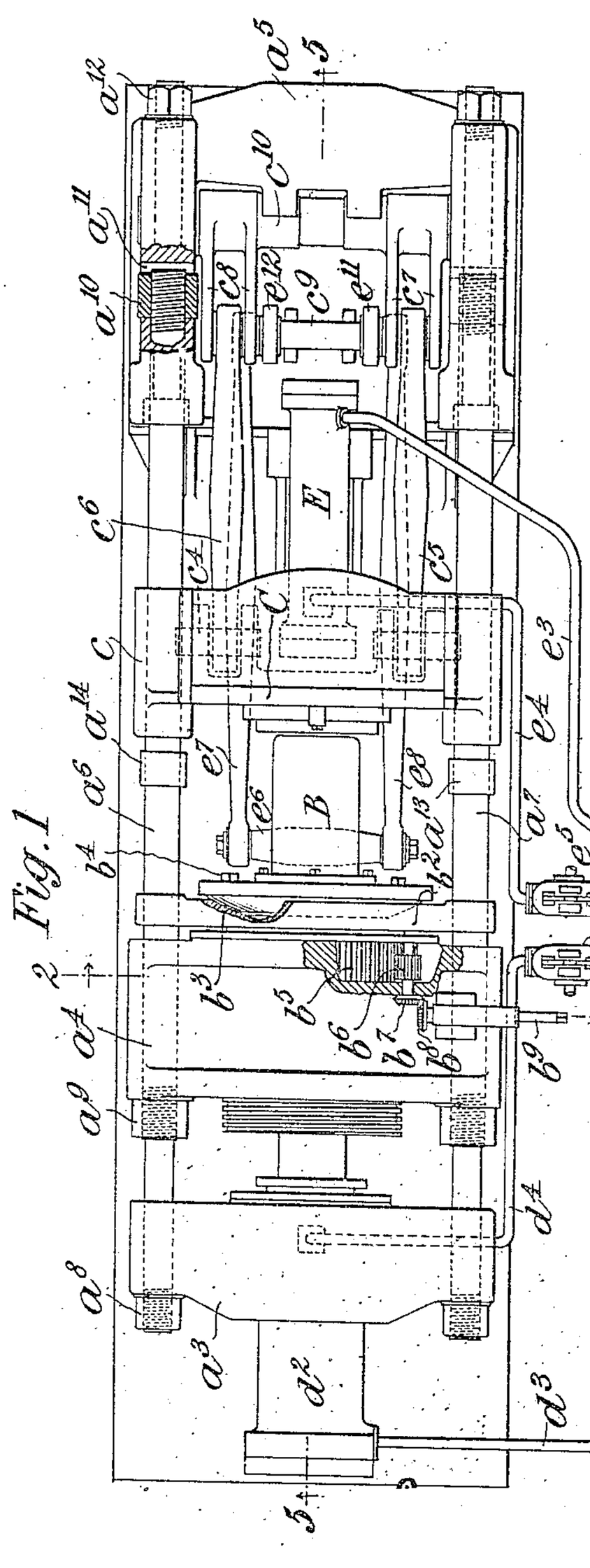

Fig. 1

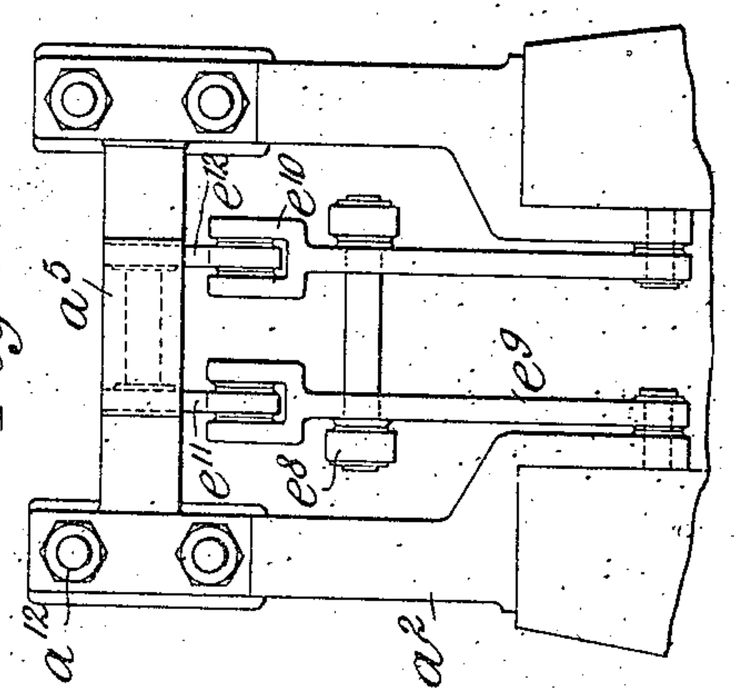

Fig. 3.

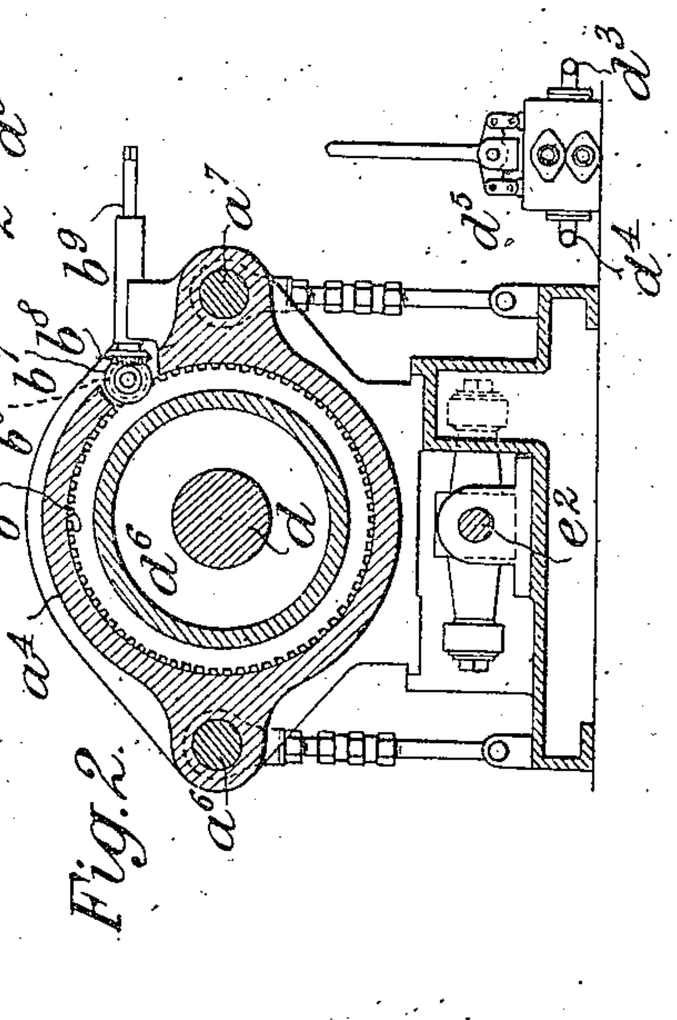

Fig. 2.

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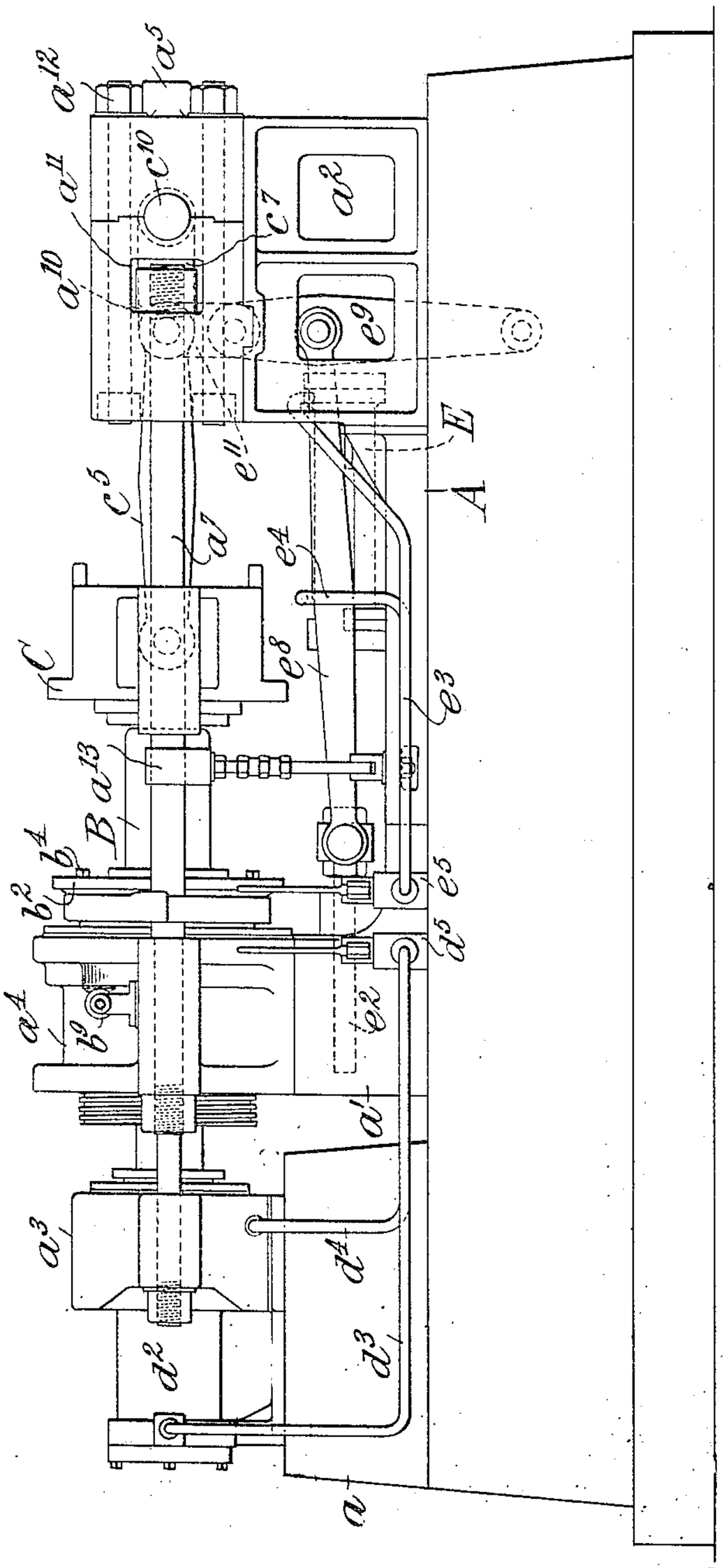
3 SHEETS—SHEET 2.

Fig. 4.



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3 SHEETS—SHEET 3.

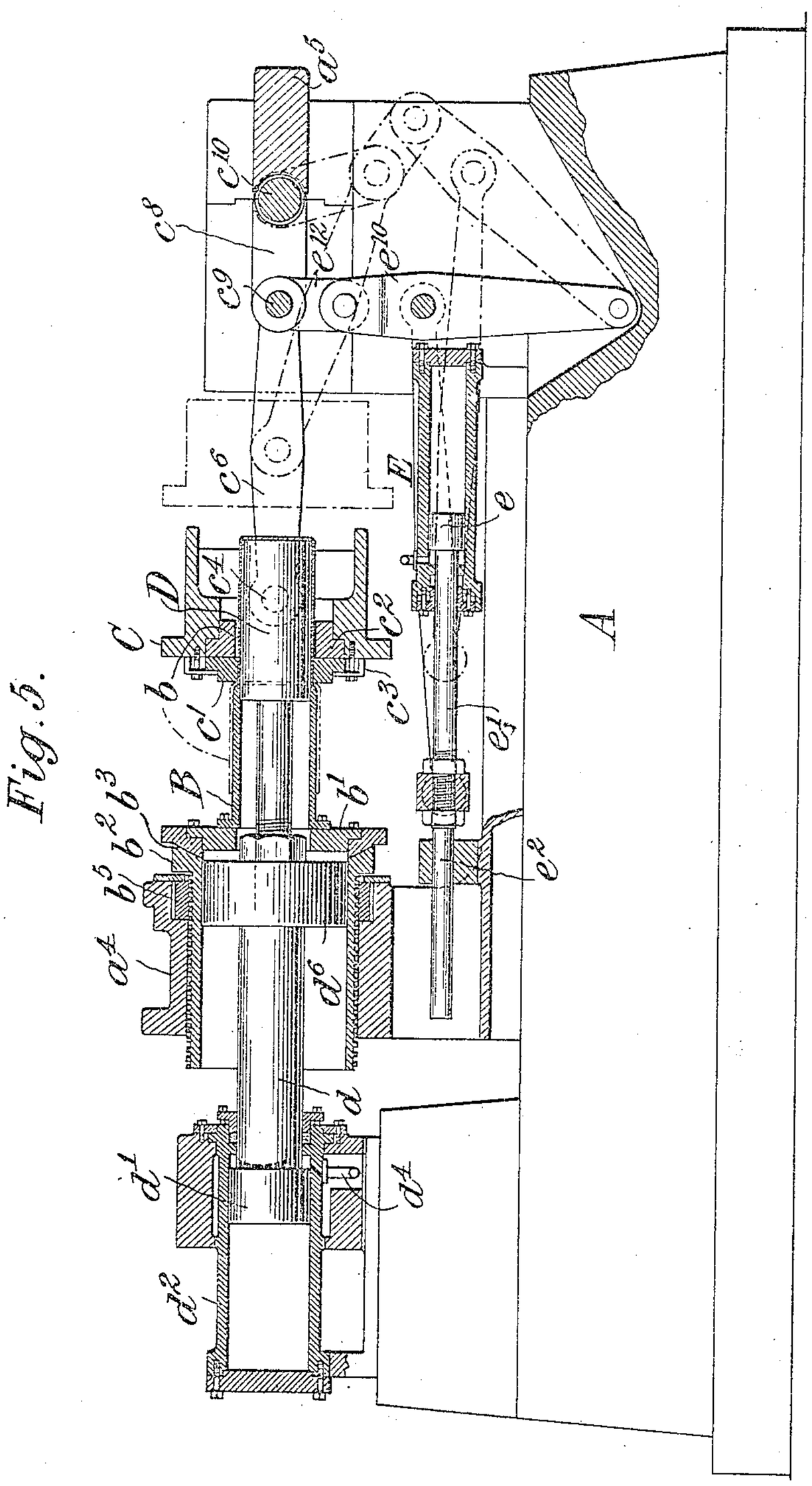

Fig. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM KLOCKE AND FREDERICK ORTON, OF NEW YORK, N. Y., ASSIGNORS TO E. W. BLISS COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF WEST VIRGINIA.

HYDROMECHANICAL DRAWING-PRESS.

998,968. Specification of Letters Patent. Patented July 25, 1911.

Application filed August 17, 1910. Serial No. 577,667.

To all whom it may concern:

Be it known that we, WILLIAM KLOCKE, residing in the borough of Brooklyn, county of Kings, city and State of New York, and FREDERICK ORTON, residing at Glendale, in the borough and county of Queens, city and State of New York, both citizens of the United States, have jointly invented certain new and useful Improvements in Hydromechanical Drawing-Presses, of which the following is a specification.

Our invention relates to drawing presses, particularly of that type adapted to perform very heavy work, although it may be found useful in connection with other types of machine, employing a movable table. The advantage in a press of this character wherein the punch is operated by hydraulic means, of having the table also moved by hydraulic means, has long been recognized. We have devised an improved construction of such machine employing power increasing connection of novel and advantageous type between the table and its hydraulic operating means, wherein also we have provided novel and useful means for adjusting the blank-holder and its support, and wherein we have also presented numerous other novel and advantageous structural features which will appear as the description proceeds. In the drawing is illustrated an organized machine containing our invention. This is a desirable form, but does not necessarily represent the limits of our invention, as changes may be made therein within the limits of the appended claims.

In the said drawings,—Figure 1 is a plan view of our machine, in part broken away; Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1, looking to the right; Fig. 3 is a rear view of the right hand end of the machine of Fig. 1; Fig. 4 is a side elevation thereof; and Fig. 5 is a central sectional elevation on the line 5—5 in Fig. 1.

As illustrated in the accompanying drawings, our machine is mounted upon a base or standard A having uprights a a^1 a^2, and connecting cross pieces or bridges a^3 a^4 a^5, and these are held together against the longitudinal strain of the operating members by side stay rods a^6 a^7 which are held in place by passing through the bridges a^3 and a^4, and by nuts a^8 a^9, and at their rear ends these stay pieces are received within channels in the upper part of the uprights a^2 and there held by nuts a^{10} which are accessible through openings a^{11} in the side of said uprights. Upper and lower stay bolts a^{12} pass longitudinally through the uprights a^2 on each side of the machine, and serve to stiffen and strengthen the same and to tie in place the rear part thereof which is made removable to receive the shaft c^{10}, the purpose of which is hereafter explained. Adjustable side supports a^{13} a^{14} are connected to each stay rod and to the base of the machine, and provide means whereby the stay rod may have its vertical position adjusted as desired. Bridge a^4 is mounted to slide on its support as shown in Fig. 2 so that the alinement of the parts will be preserved when the stay rods stretch in use, and bridge a^3 is similarly mounted.

Our machine as illustrated employs a stationary adjustable blank holder B, a moving punch D, and a movable work table C. As illustrated, the blank holder is in the form of a hollow annular shell, upon the periphery of which the blank b is placed. This blank holder may be made removable for the purpose of substituting one size for another, and to this end it is illustrated as being seated in a head b^1 to which it is removably attached as by bolts. It may be found desirable to permit this head to have a slight movement, and it is shown as being connected to its support b^2 by a swivel joint, as at b^3, and may be there held by screw bolts b^4 which permit a slight movement. The support b^2 for the blank holder is in the form of a sleeve or collar which is made hollow for a purpose presently to be described, and is mounted within the hollow bore of the bridge a^4. This support is threaded externally for the purpose of adjusting it to and fro, and may be adjusted as desired by a rotatable internally threaded collar b^5, which is fixed in an annular groove in the bridge a^4, and is geared externally and turned by pinion b^6 operated through miter gears b^7 b^8 and through shaft b^9 which may be turned by any suitable means, as for instance a wrench. It will be perceived that the turning of the shaft b^9 will adjust the blank holder B to and fro as described.

The punch D is mounted upon a shaft d and controlled by a hydraulic piston d^1 within the cylinder d^2. Water may be admitted to this cylinder to either face of the piston through pipes d^3 d^4, and the admis-

sion of such water is controlled through hydraulic valve mechanism d^5. A guide d^6 is mounted upon the shaft d, and slides within the hollow sleeve b^2 and serves to guide the said shaft in its to and fro movements.

The work table C may be of any desired form or construction. As illustrated, it is mounted upon a frame c which extends substantially the width of the machine and is perforated to receive the stay rods a^6 a^7 upon which the said frame is supported, and slides to and fro, and which direct and guide its movements. Substantially midway between the two stay rods and in line with the blank holder, is mounted the female die c^1 which may have a supporting backing ring c^2. The said die is preferably made removable for the purpose of changing sizes, and to this end is removably attached to the table C, as for instance by clips c^3 bolted to the table and engaging a shoulder on the die. We have illustrated the said work table as movable to and fro, and the means for causing such movement we have illustrated as being a hydraulic piston.

A connection between the piston and the table whereby the table may be moved by the hydraulic piston without causing undue pressure between the table and the blank held upon the blank holder due to any excess or deficiency of movement of or any excess of pressure applied to the piston, we regard as of extreme importance, and as constituting a very important feature of our invention. Such connection as illustrated includes a toggle joint which is arranged perpendicular to the line of motion of the hydraulic piston, and also perpendicular to the plane of movement of the table, and which we have illustrated as connected to a second toggle joint directly connected to the table. The particular arrangement of such toggle joint illustrated we regard as desirable, but we do not wish to be limited to such arrangement, as other forms could easily be devised.

The means for operating the table include a hydraulic cylinder E inclosing a piston e connected to a piston rod e^1 which is guided in a perforated block e^2 attached to the base of the machine. Water is admitted to the cylinder at the opposite faces of the piston through pipes e^3 e^4 controlled by a hydraulic valve mechanism e^5. The piston rod e^1 is connected to a cross head e^6 (Fig. 1) to which are attached the means for operating the toggle joints which as shown comprise pivoted links e^7 e^8 disposed upon each side of the said cross head, and at their rear ends connected to rocking arms e^9 e^{10} which are pivoted to the base of the machine, and at their upper ends are pivoted to short links e^{11} e^{12}. The table C as illustrated includes transversely arranged posts c^4 upon each side upon which are pivotally mounted the forward arms c^5 c^6 of a toggle joint, the rear arms of which c^7 c^8 are illustrated as bifurcated, and are connected to the said forward arms through a shaft c^9 upon which both of said arms are mounted to swing. The rear knuckles of the toggle joint are pivoted upon a fixed shaft c^{10} which is mounted in the upright a^2 and effectually supports the said shaft. It is important that this shaft should receive ample support, as it bears the working strain on the table. The upper joints e^{11} e^{12} of the lower toggle member are connected to the shaft c^9, thereby furnishing the connection between the two toggle members. By means of the said toggle joints the table may be forced forward for the performance of its function of holding the blank upon the blank holder while the punch performs its work, by means of a hydraulic piston of much less power than is required for the punch, owing to the fact that the power is magnified through the toggle joints. The adjustability of the blank holder permits it to be brought to any desired position, and the toggle joints permit the table to be brought forward to the blank holder and to insure a perfect dwell thereon with uniform pressure. If as is frequently the case the hydraulic piston has a slight excess movement, the same will be taken up through the two toggle joints and will not vary to any appreciable extent the pressure of the table upon the blank. This is extremely important, as if the hydraulic piston were directly connected to the table, the table would frequently be forced upon the blank holder with such pressure that the punch would be unable to operate satisfactorily, and simply tear the blank rather than drawing it.

The operation of our device is as follows:—A blank holder B of the proper shape to perform the work in hand, is attached to the frame b', and a blank b is placed thereon. The table, to which a suitable female die c^1 has been applied, is then in the rearward position indicated at dotted lines in Fig. 5, with its directly connected toggle similarly in dotted line position. The hydraulic valve mechanism e^5 is then operated by hand if desired, and water is caused to pass through the pipe e^3, forcing the hydraulic piston e forwardly and causing a similar movement to the piston rod e^1, and bringing the toggles to the upright position shown in full lines in Fig. 5, in which position the blank is firmly grasped between the die c^1 and the blank holder B, and the punch D is permitted to draw the work from the blank holder to the recess in the table provided for that purpose. It will be perceived that any slight excess movement of the hydraulic piston which may move the arm e^{10} one way or the other, will have

scarcely any appreciable effect upon the shaft c^9, and no effect at all upon the position of the table, and the presence of such indirect means of communicating the power of the hydraulic piston to the table, enables us to employ hydraulically operated means to move the table. The adjustment of the blank holder permits us to obtain any desired intensity of pressure upon the blank, and practically in operation the hydraulically operated table fitted with our novel means for operatively connecting it to the hydraulic piston, is as certain and efficient in operation as is the usual mechanical drawing press.

The provision of the indirect connection between the hydraulic table operating means and the table, and of the direct connection of the punch with its hydraulic piston, permits the entire drawing press to be operated by hydraulic means. This is accomplished by the construction which permits the table to dwell upon the blank while the punch is fed and withdrawn and to be then withdrawn. We thereby provide a machine wherein the hydraulic valves are adapted to automatic control, as the dwell of the table is uniform and sufficient to enable the punch to perform its function.

We have illustrated what we regard as a practical and efficient organized machine for embodying our invention as described. Many of the parts of the machine may be changed, and the same may be modified according to the character of the work in hand, and within the skill of the mechanic, without departing from our invention.

We claim as our invention:—

1. In a drawing press, a stationary, adjustable blank holder, a movable table, a hydraulic piston for moving said table, and a connection between said table and piston including a toggle joint.

2. In a drawing press, a movable punch, a stationary blank holder, and means for adjusting said blank holder comprising a threaded supporting member for said blank holder, a rotatable worm for engaging same held against axial movement, and means for rotating same.

3. In a drawing press, a punch, a stationary hollow blank holder, means for adjusting same comprising a hollow supporting member and means for adjusting said supporting member to position, said supporting member serving as a guide for the punch.

4. In a drawing press, a movable table, a hydraulic piston for moving same, a toggle joint normally perpendicular to the plane of movement of said table and having a fixed pivotal point, and a connection to said piston, a second toggle joint directly connected to said table and having a fixed pivotal point, and a connection between said toggles.

5. In a drawing press, a movable table and means for moving same comprising a hydraulic piston, a piston rod, a cross head carried thereby, a plurality of toggle joints having fixed pivotal points and normally perpendicular to the plane of movement of said table, links connecting said cross head and toggles, a plurality of toggle joints directly connected to said table and having fixed pivotal points, and connections between said two sets of toggles.

6. In a horizontal drawing press, a horizontally moving table, moving means therefor including a toggle joint having a fixed rear pivotal point in line with said table and at its forward point directly connected to said table, and when straightened establishing a direct connection between said table and said fixed pivotal point, whereby said fixed pivotal point receives a direct thrust without torsion, and hydraulic means for operating said toggle joint.

7. In a drawing press, a hollow blank holder, a hollow adjustable support therefor, a punch moving through said blank holder and support and guided by the latter, directly connected hydraulic means for moving said punch and a movable table, hydraulic means for operating same, and an indirect connection between said operating means and said table comprising a plurality of perpendicularly arranged toggle joints each having a fixed pivotal point, one of which is connected to said hydraulic operating means at a point intermediate its ends and one of which is connected to said table, and a connection from said toggle which is connected to the hydraulic operating means and the toggle connected to the table at a point intermediate the ends of the latter.

8. In a horizontal drawing press, a hollow blank holder, a hollow adjustable support therefor, a punch moving through said blank holder and support and guided by the latter, directly connected hydraulic means for moving said punch, a movable table and hydraulic means for operating the same of less power than the hydraulic punch operating means, and an indirect connection between said operating means and said table comprising a toggle joint connected to said table and having a fixed pivotal point at the rear of and in a direct line with the path of movement of said table and a second toggle joint disposed perpendicularly with relation to said first-mentioned toggle and connected thereto, the said hydraulic table operating means underlying said table and connected to said last-mentioned toggle.

9. In a drawing press, a movable tool, hydraulic means for operating same and a power increasing connection between said parts comprising a toggle joint directly connected to said movable tool and having a pivotal thrust bearing at its opposite end

and extending in a direct line between said table and said bearing.

10. In a drawing press, a movable tool, hydraulic means for operating same, and a power increasing connection between said parts comprising a toggle joint directly connected to said movable tool and having a pivotal thrust bearing at its opposite end and extending in a direct line between said table and said bearing, and a second toggle joint disposed perpendicularly with relation to the first and connected thereto between the point of attachment to the table and the said thrust bearing.

11. In a horizontal drawing press, a movable tool, hydraulic means for operating same comprising a horizontal hydraulic piston disposed beneath said tool, and a power increasing connection between said parts comprising a toggle joint directly connected to said movable tool and having a pivotal thrust bearing at its opposite end and extending in a direct line between said table and said bearing.

12. In a horizontal drawing press, a movable tool, hydraulic means for operating same comprising a horizontal hydraulic piston disposed beneath said tool, a power increasing connection between said parts comprising a toggle joint directly connected to said movable tool and having a pivotal thrust bearing at its opposite end and extending in a direct line between said table and said bearing, and a second toggle joint disposed perpendicularly with relation to the first and connected thereto between the point of attachment to the table and the said thrust bearing.

13. In a drawing press, a longitudinally reciprocating tool-carrying cross head, longitudinal stay rods, adapted to receive the thrust of said press and passing through and guiding said cross head, uprights to which said stay rods are secured at their rear ends, and separable blocks secured to said uprights, providing a thrust bearing for said cross head, a shaft mounted in said bearing, and a toggle joint connection between said shaft and said cross head.

14. In a drawing press, longitudinal stay rods adapted to receive the thrust of the press, fixed supports for said stay rods at one end, a blank-holder support attached to said stay rods, and a cylinder likewise attached thereto and adapted to receive a punch operating piston, said blank-holder support and cylinder movable in their respective bases to preserve the alinement of the parts upon the stretching of the stay rods in use.

15. In a horizontal drawing press, a movable punch, a movable table and operating means therefor and a stationary blank-holder, means for maintaining said parts in position in operation, comprising a pair of longitudinal stay rods located one at each side of said punch and permitting easy insertion and removal of dies and blanks, said stay rods passing through and guiding said table, and adjustable supports for said stay rods located between their ends.

In witness whereof, we have hereunto signed our names in the presence of two subscribing witnesses.

WILLIAM KLOCKE.
FREDERICK ORTON.

Witnesses:
GUSTAV L. JOHNSON,
LARS J. LOEWGREN.