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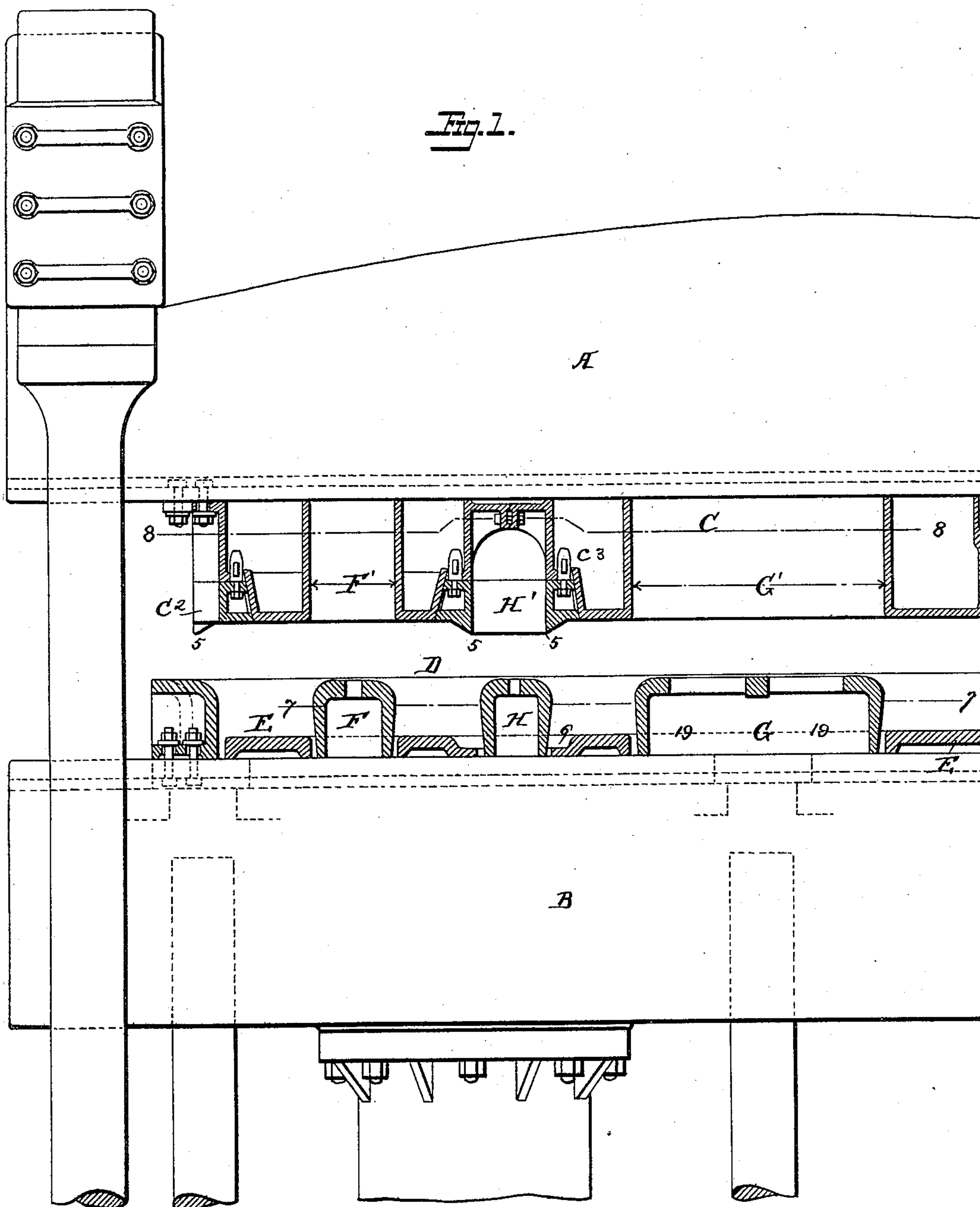
5 Sheets—Sheet 1.

S. FOX.

PROCESS OF MANUFACTURING FRAME PLATES.

No. 397,179.

Patented Feb. 5, 1889.



Witnesses,

W. S. McArthur
S. E. Johnson

Inventor,

Samson Fox
W. Foster & Freeman
Attorneys

(No Model.)

5 Sheets—Sheet 2.

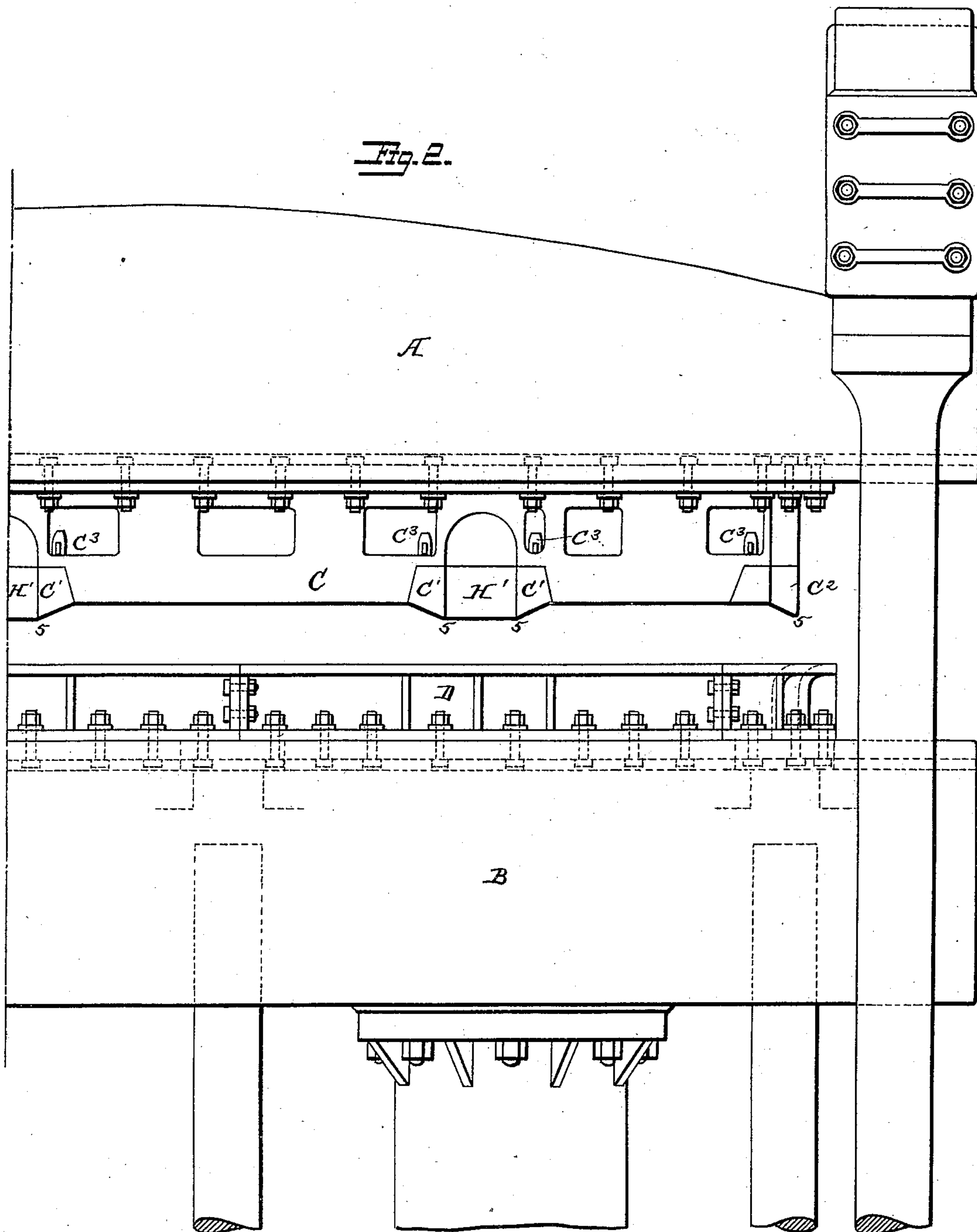
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Fig. 2.



Witnesses,
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S. E. Johnson.

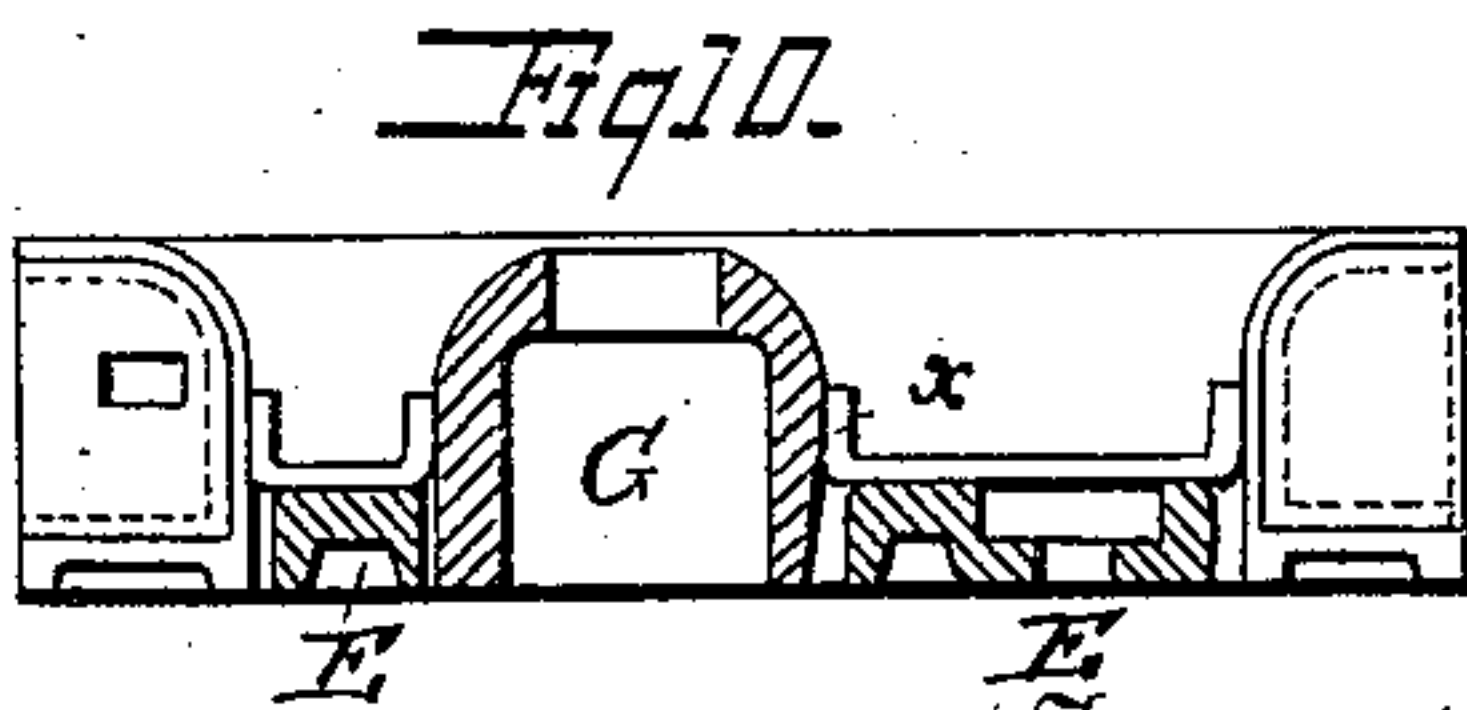
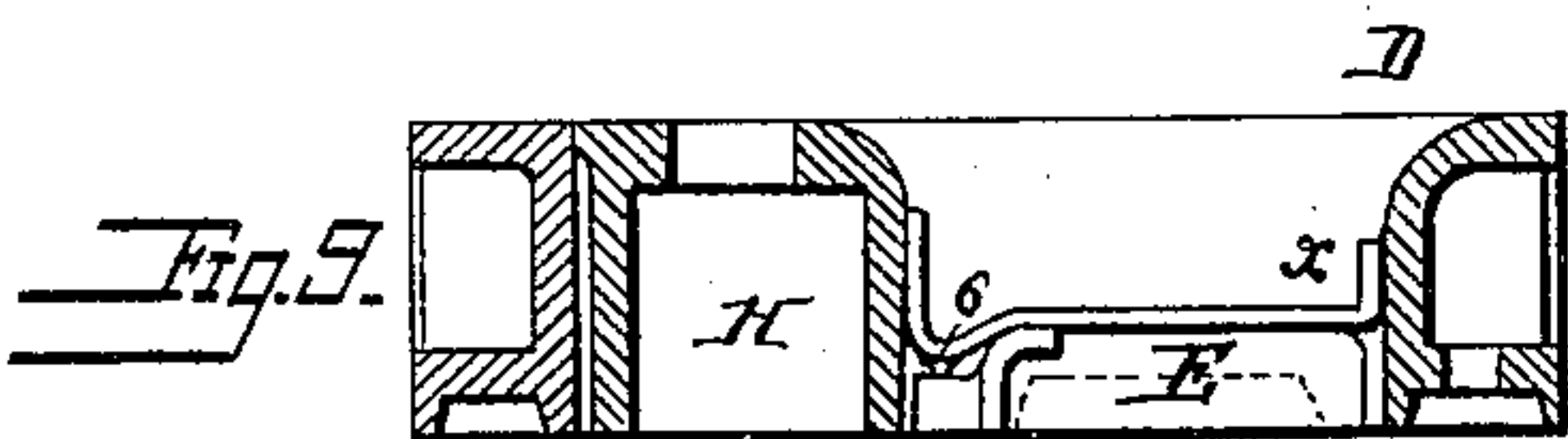
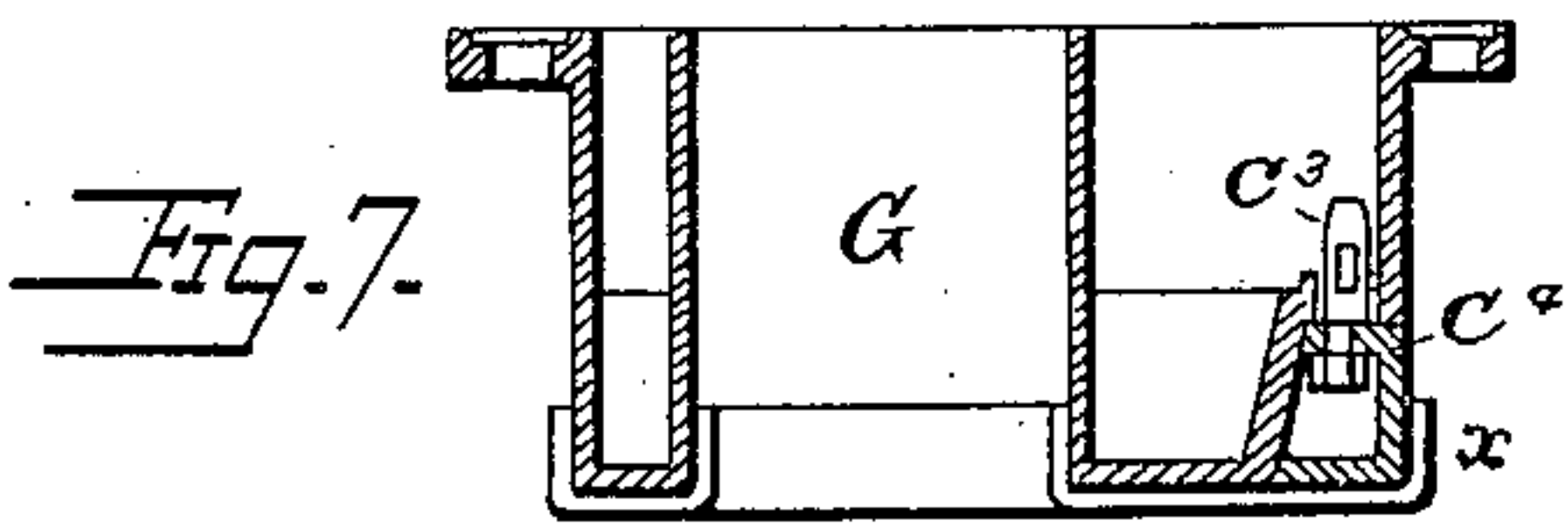
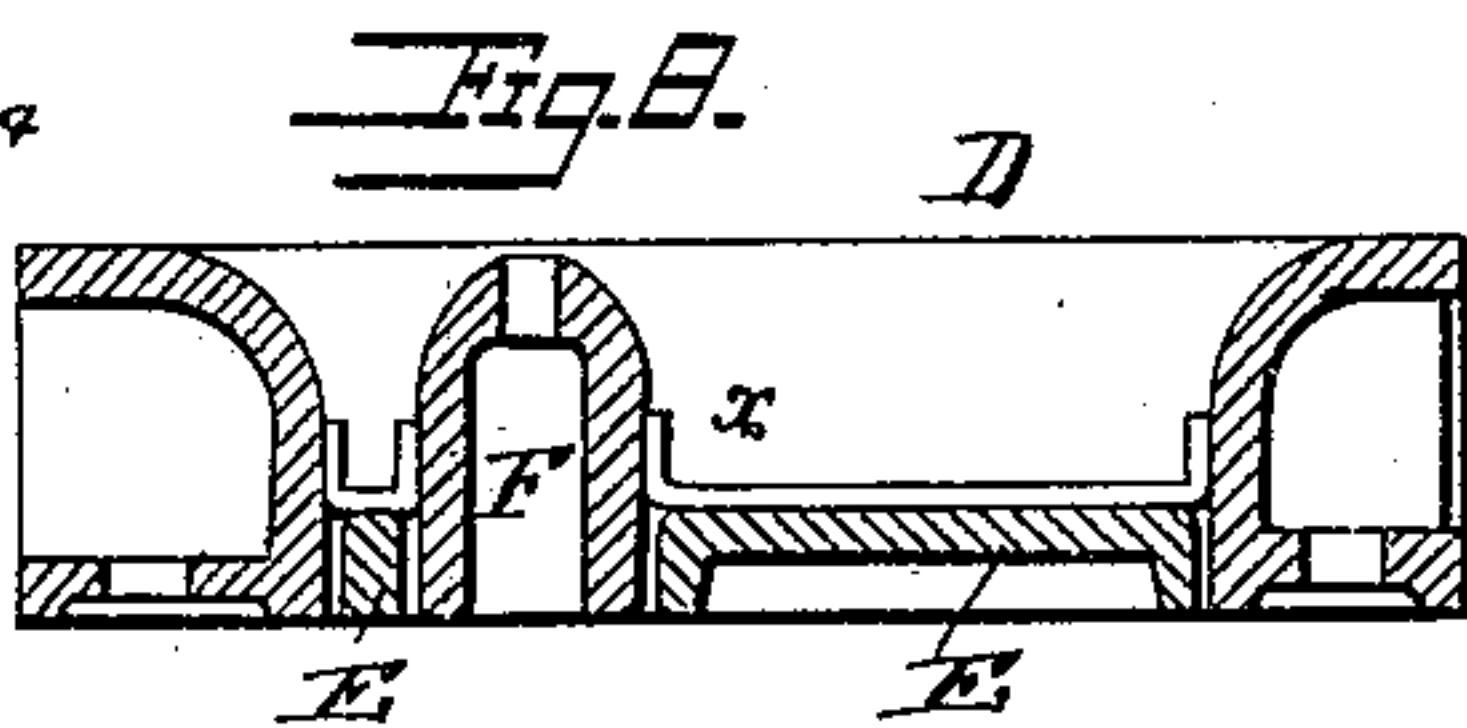
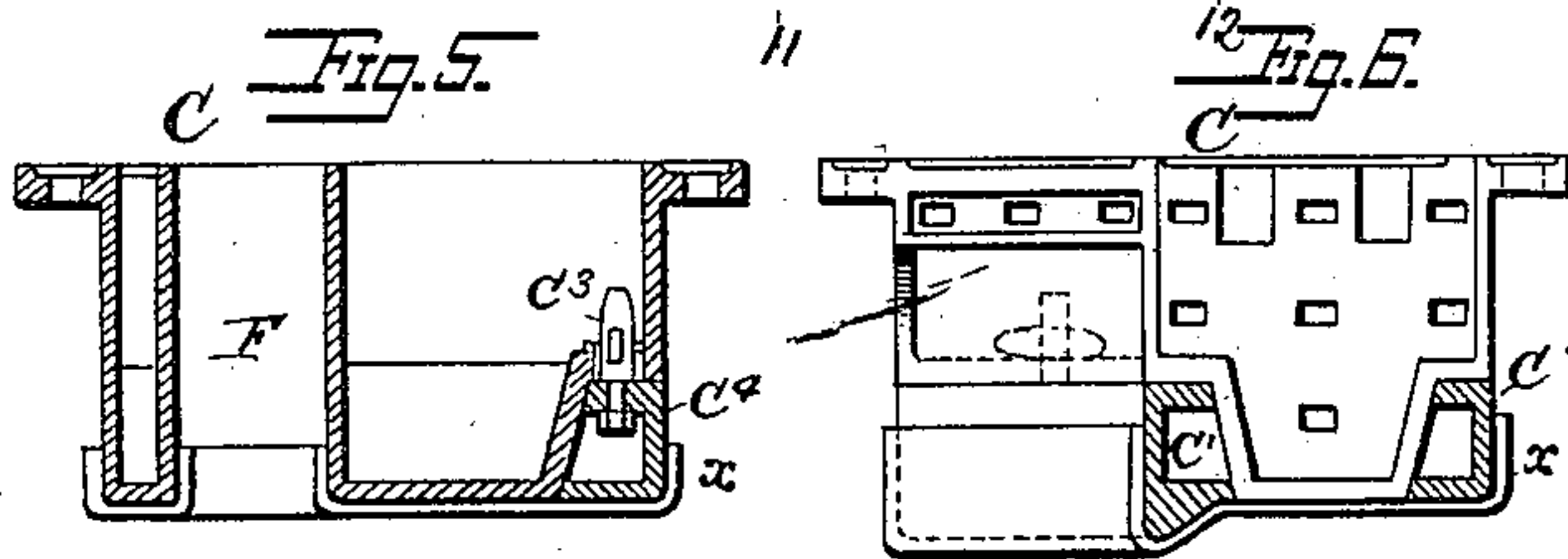
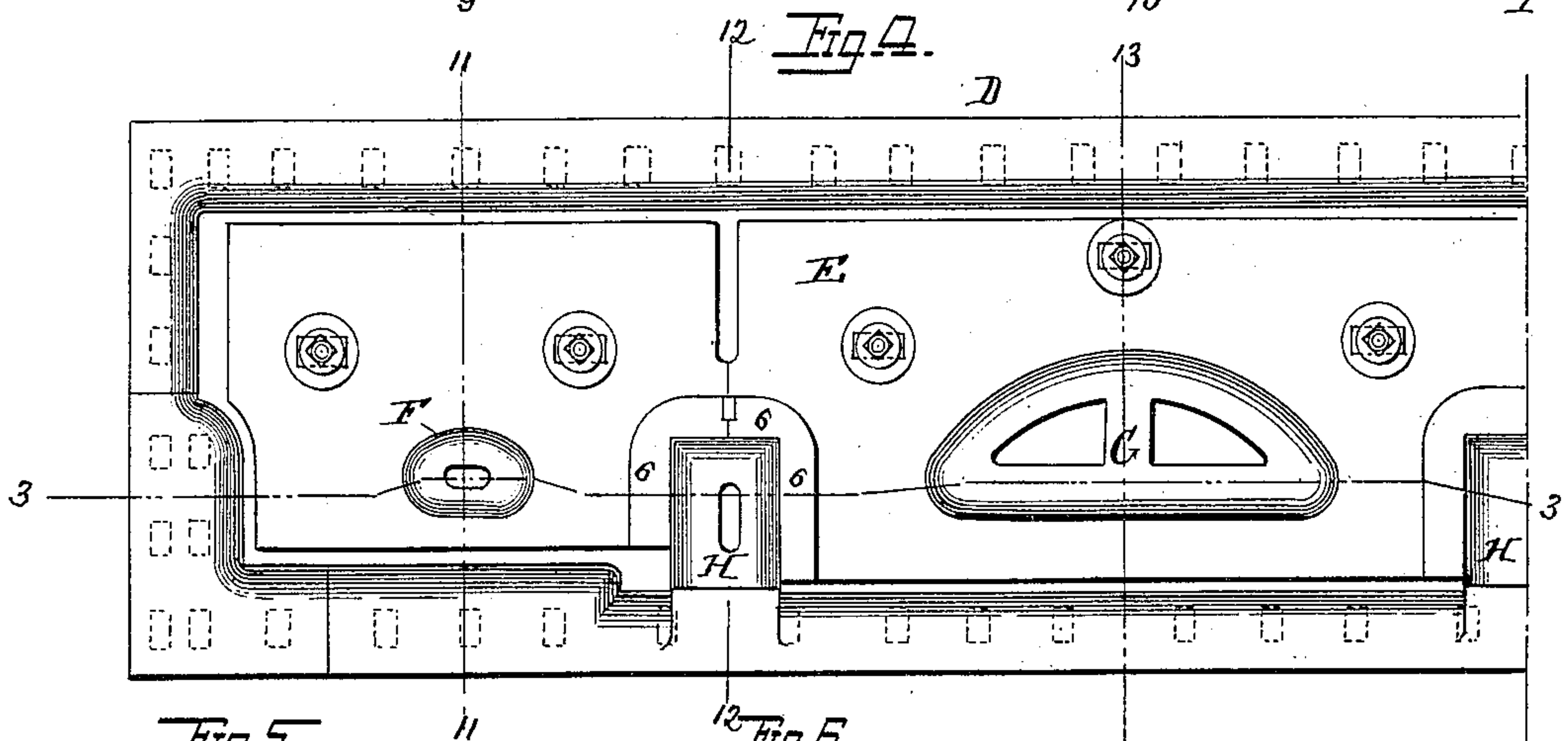
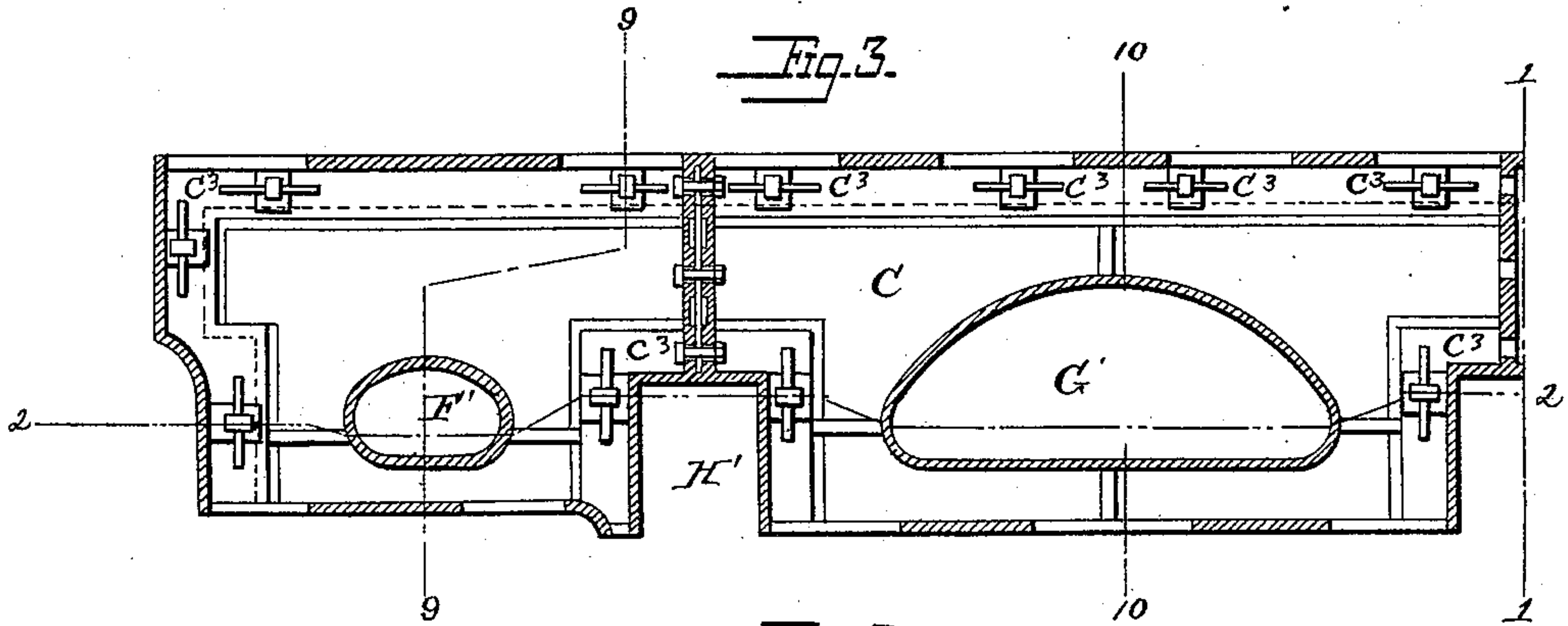
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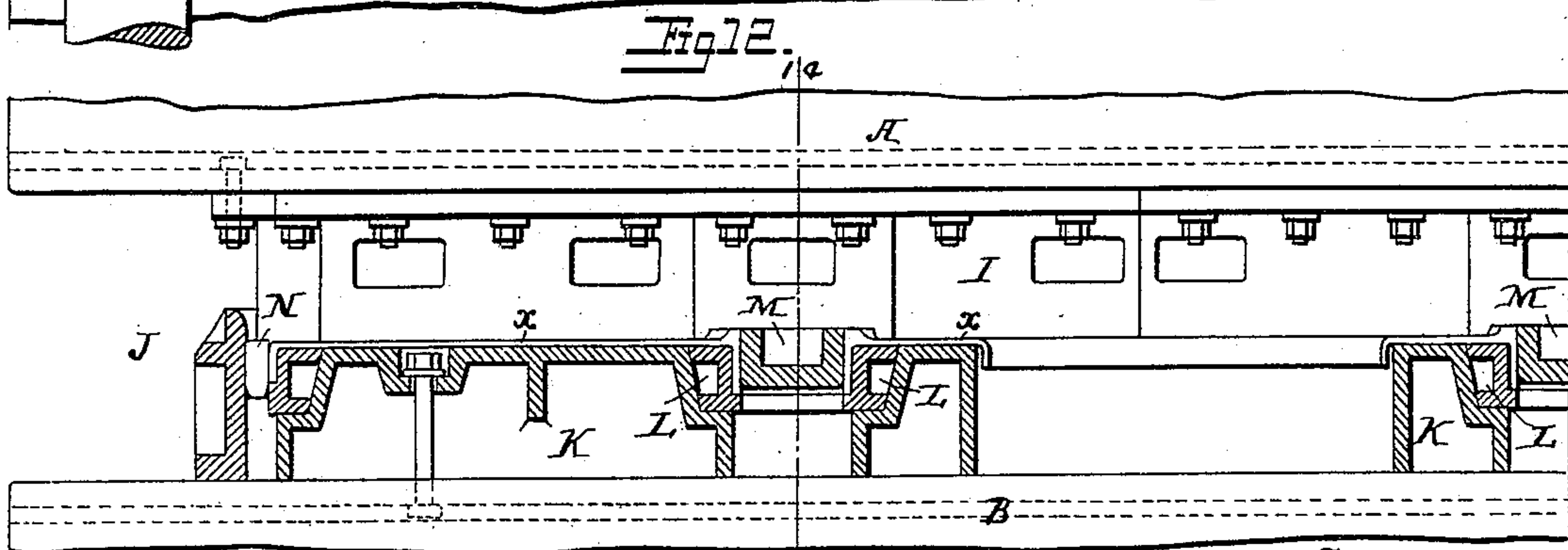
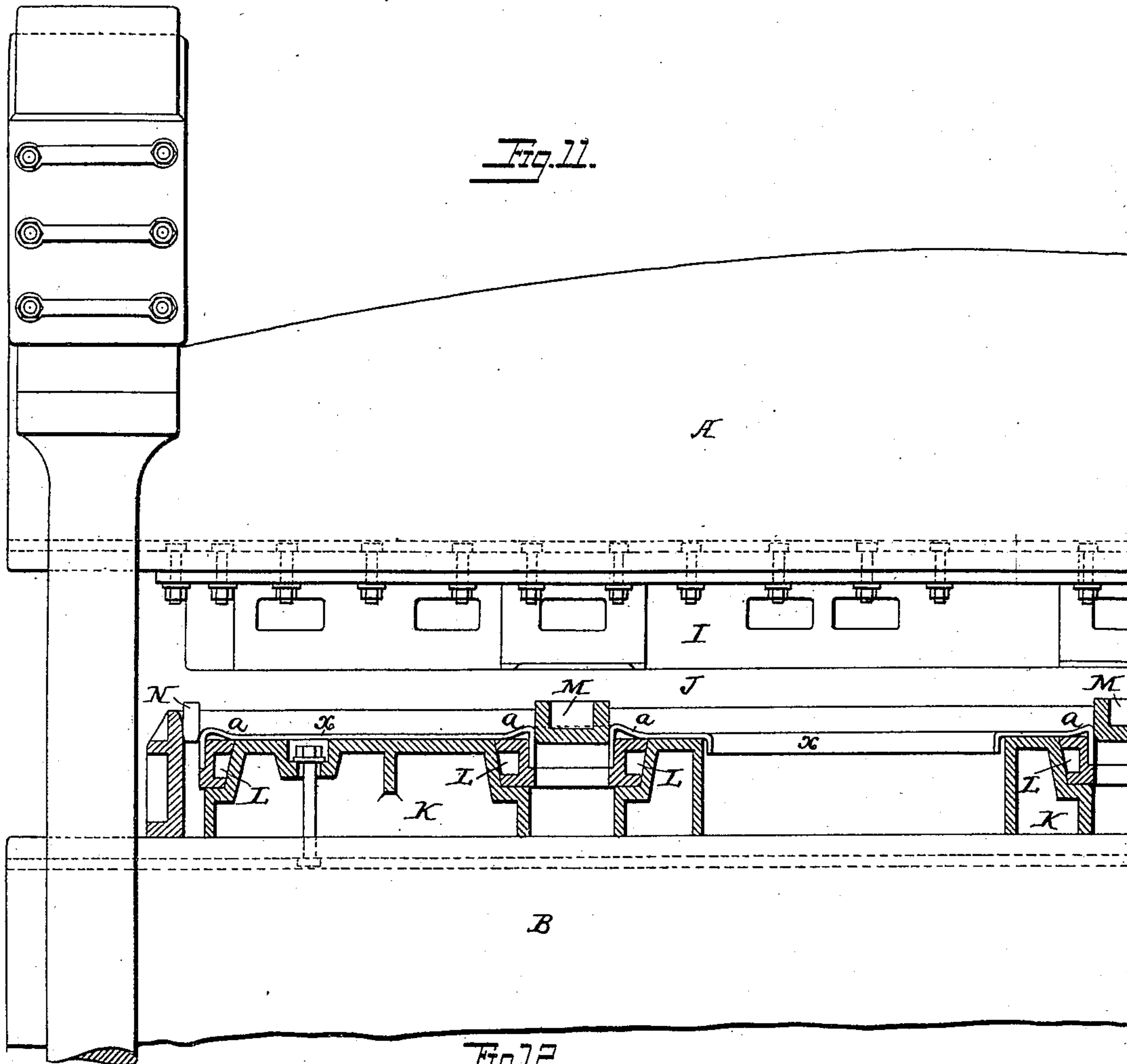
5 Sheets—Sheet 4.

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Fig. 13.

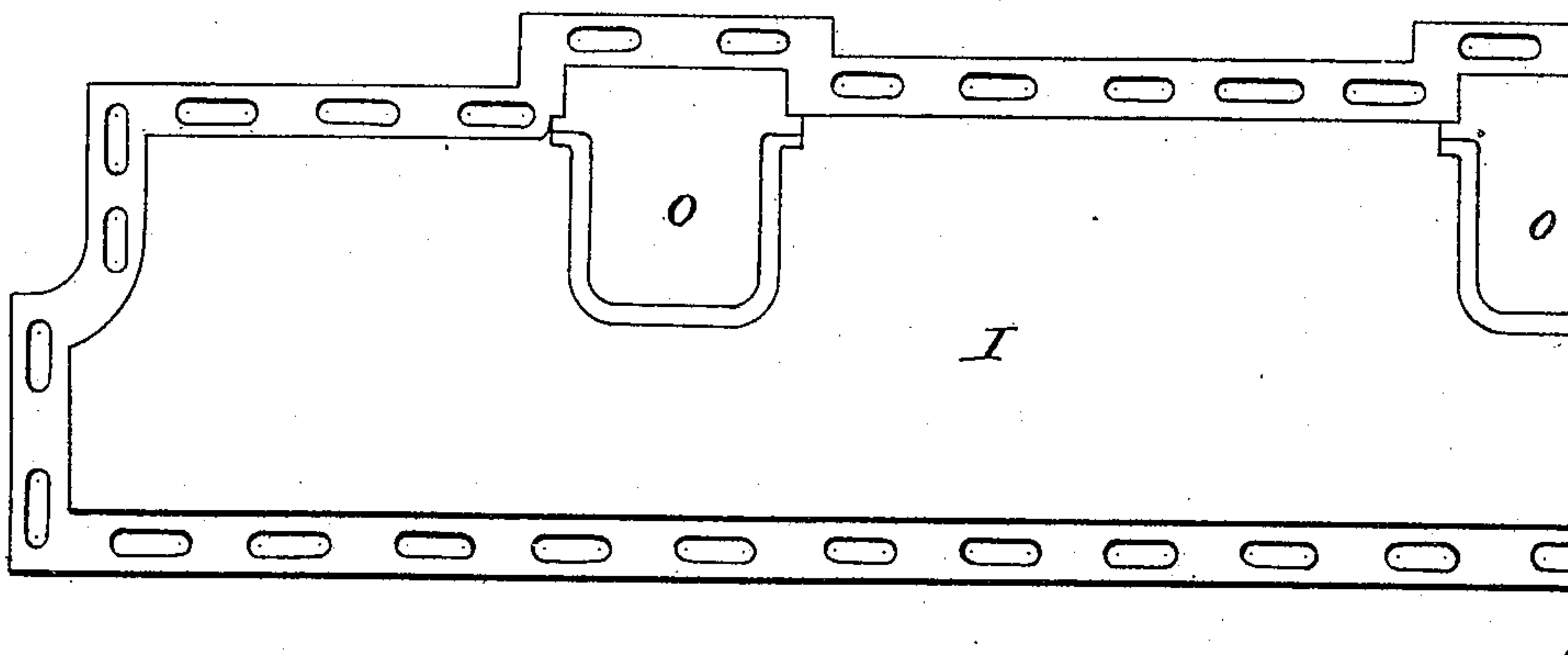


Fig. 16.

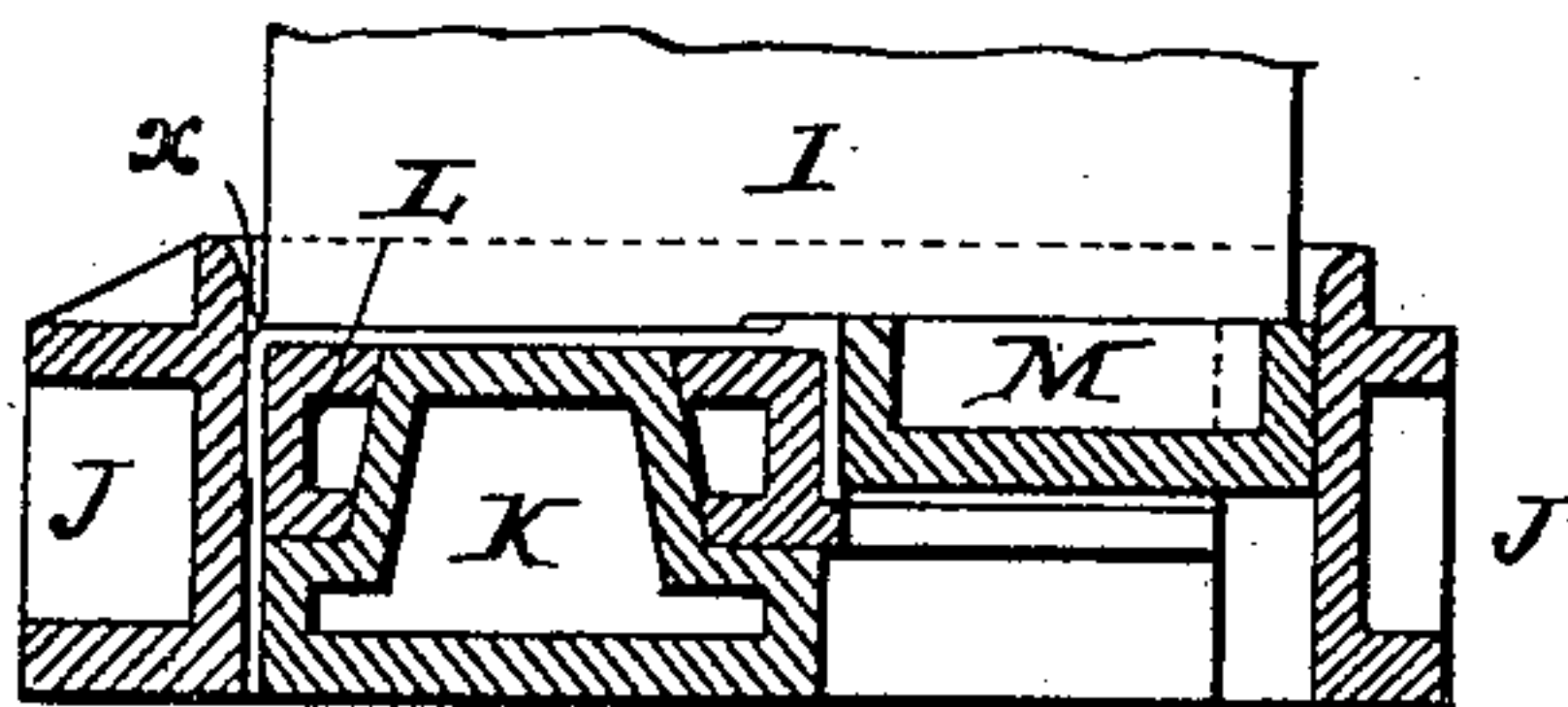


Fig. 15.

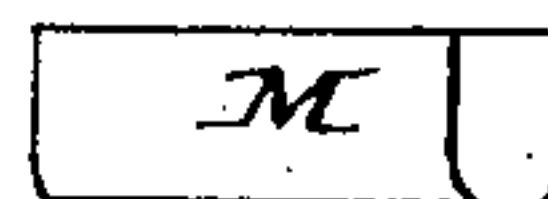
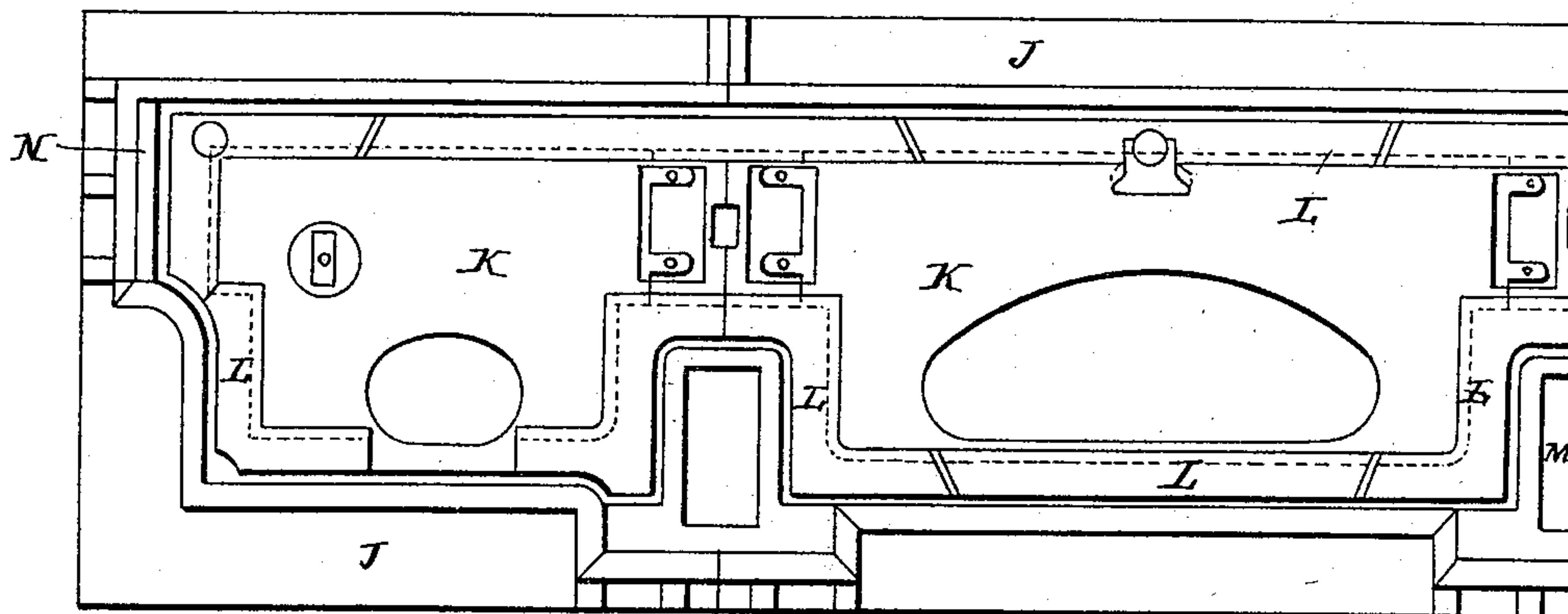


Fig. 14.



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UNITED STATES PATENT OFFICE.

SAMSON FOX, OF HARROGATE, COUNTY OF YORK, ENGLAND.

PROCESS OF MANUFACTURING FRAME-PLATES.

SPECIFICATION forming part of Letters Patent No. 397,179, dated February 5, 1889.

Original application filed January 18, 1888, Serial No. 261,166. Divided and this application filed November 21, 1888. Serial No. 291,470. (No model.)

To all whom it may concern:

Be it known that I, SAMSON FOX, residing at Harrogate, in the county of York, Kingdom of Great Britain, have invented a new and useful Process for the Manufacture of Frame-Plates, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

This invention relates to a process by which a metal box of large diameter and of considerable thickness can be formed from pressed steel, pressed hot and allowed to cool in the dies, and by means of it, likewise, such box can be made with a number of irregular flanges. In making this class of flanged plate or box the material is compressed between male and female dies, and if the heated metal is allowed to cool while surrounding the male die it becomes practically impossible to remove such inclosing-box from said male die without destroying the same. On the other hand, if the dies be suddenly separated in the process of cooling the said box will warp and change its shape, so as to be practically useless. This fact I have demonstrated in the making of large flanged plates on the apparatus hereinafter described in this specification, when the pressure has been suddenly withdrawn from the metal. By my present invention I accomplish the double result of preventing said warping and twisting out of shape when the die is suddenly withdrawn, and of at the same time preventing the binding of the shaped metal upon the male die. This process can be carried out by a large number of machines, and is especially applicable to the formation of those plates in which flanges are made at right angles to the body of the plate itself, and which in cooling would shrink upon the male die and prevent the withdrawal of the plate.

My invention consists in withdrawing laterally and very gradually the pressure upon the metal plate exerted between the male and female dies during the process of cooling said flanged plate. I do not in this application limit myself to the special form of mechanism for accomplishing this result. Many such machines could be devised; but by my apparatus by the release of lateral pressure simul-

taneous with the cooling of the metal I accomplish a double result never before accomplished.

Now, my present invention has reference to a process for performing these operations, as I will proceed to describe with reference to the annexed five sheets of drawings.

Figure 1, Sheet 1, shows to line I in elevation part of a hydraulic machine with male die C in section on the line 2 2 of Fig. 3, and female die D in section on the line 3 3 of Fig. 4, corresponding to half the length of the frame-plate to be produced. Fig. 2, Sheet 2, shows in elevation from the line I the other half of the machine. Fig. 3, Sheet 3, is a sectional plan of male die C C' C² on line 8 of Fig. 1. Fig. 4, Sheet 3, is a plan of female die and flooring E with punches F, G, and H in their places in the machine. Fig. 5, Sheet 3, is a sectional elevation of male die C C' C² on line 9 of Fig. 3. Fig. 6, Sheet 3, is a sectional elevation of male die C C' C² through one of the parts in which the axle-box openings are flanged and bulgings around same are formed. Fig. 7, Sheet 3, is a sectional elevation of male die C C' C² on line 10 of Fig. 3. Fig. 8, Sheet 3, is a sectional elevation of female die D, flooring E, and punch F on line 11 of Fig. 4. Fig. 9, Sheet 3, is a sectional elevation of female die D, flooring E, and punch H on line 12 of Fig. 4, showing the recesses 6 in the flooring for admitting the bulged part of the plate surrounding and opening. Fig. 10, Sheet 3, is a sectional elevation of female die D, flooring E, and punch G on line 13 of Fig. 4. Fig. 11, Sheet 4, shows in sectional elevation part of a hydraulic machine with the dies for forming the fillets or projections around the axle-box openings and square corners at the ends out of the bulged portions of the previously-bulged plate. Fig. 12, Sheet 4, is a sectional elevation of part of the machine with the flanged filleted plate compressed between the dies. Fig. 13, Sheet 5, is a face view of the same die, I. Fig. 14, Sheet 5, is a plan of half of the female die J, with the inner floor and loose parts and the mandrels M and N in position. Fig. 15, Sheet 5, is a side elevation of the mandrel M; and Fig. 16, Sheet 5, is a cross-sectional elevation showing female die

J on line 14 of Fig. 12, also loose parts L L around the axle-box openings, and loose parts in section running the whole length of the straight side of the die and around the ends of a flanged filleted frame-plate being shown between dies I and J.

For the purpose of making in one piece of metal a frame-plate with flange or flanges at one side to give the required strength and rigidity, and with a fillet or fillets at the contrary side around the openings for the axle-boxes according to my present invention, male and female dies of special construction are employed. They are such as to make the said fillets with square internal corners, as also to produce at the ends of the frame-plates square external corners.

A is the head of the machine, and B is the rising table or platform, actuated by hydraulic or other suitable mechanism. To the head A is fixed a compound male die, C C' C², which is of a form corresponding to the general configuration of the intended frame-plate with its flange or flanges, C' C² being parts attached to the principal part G for forming, in conjunction with the female die, the before-mentioned bulgings, which parts C' C² are afterward by suitable means released from the main part G of the male die.

D is a wide-mouthed female die or matrix, the walls of which are curved or rounded inside at the upper part, and upon which the roughly-shaped plate to be treated is placed while hot. This die has an internal configuration corresponding to the outline form required to be imparted to the frame-plate. It will be understood, therefore, that the forms of the male and female dies are subject to variation to suit the shape of frame-plate required.

The female die or matrix D is fixed to the rising table or platform B. E is the floor of this female die.

6 6 are recesses opposite the projections 5 of the male die. By these projections and the recesses 6 the bulgings above referred to are formed upon the frame-plate. The floor E is securely fixed to the table B.

F and G are punches, which, together with the corresponding openings, F' and G', in the male die, form the flanges around the "lightening-holes" in the frame-plate.

H is one of a series of punches which, in conjunction with openings H' in the male die, effect the flanging and bulging around the openings in the frame-plate for the axle-boxes. All these punches are placed loosely in openings in the floor E of the female die D, and are rounded at their tops to enable them to turn the said flanges. Below their rounded parts, at and from line 7, they gradually diminish in width as they proceed downward, so as to be free within the newly-formed flanging, and on the recession of the table B from the male die can be easily removed previously to the flanged plate being taken out of the female die.

It will be understood that the machine comprises not only the parts shown in Fig. 1, but also those shown in Fig. 2.

Figs. 5, 6, and 7 show the part C¹, which runs the whole length of the male die, and is fitted thereto with a beveled joint and fixed with bolts and cotters, as in the case of the parts C' and C², and is released at the same time and in the same manner as those parts—namely, on the flanging operation being completed and removal of the above-mentioned cotters—to permit of contraction of the frame-plate due to cooling. Figs. 5, 6, and 7 also show the flanged frame-plate X upon the male die C; and Figs. 8, 9, and 10 show it as it would be within the female die D before removal therefrom for the next operation or trimming of the edges of the flanges previous to the formation of the required fillets or projections around the axle-box openings and square corners at the ends. The male and female dies and mandrels used for this purpose are shown in Figs. 11 to 16, both inclusive.

I is the male die, attached to the head A of the machine.

J is the female die, with its component interior parts or floor, K, attached to the table B of the machine, and loose parts L, fitted to the said floor with beveled joints, (as in the case of the first-named male die C C' C².) These parts L, being at the upper side of the part K, do not require bolts and cotters, but will rest thereon.

The frame-plate X in the form in which it leaves the dies C, C', C², and D is reheated, and then is placed flange downward in the female die J, as shown in Fig. 11. Mandrels M (shown in side view in Fig. 15) are placed within the buckled parts of the axle-box openings, and mandrels N are placed between the buckled parts of the ends of the plate and the inner end of the female die J to back up the metal of such parts during the formation of the projecting fillets and square corners. The whole is then caused to advance against the male die I, the face view of which is shown in Fig. 13. O O are recesses therein for forming the projecting fillets. The surfaces of these recesses press upon the mandrels M and cause them to descend into the axle-box recesses, pressing at the same time upon the buckled parts of the frame-plate and causing the metal thereof to enter or flow into parts of the said recesses, and to form the required fillets with square internal corners the plain surfaces of the main die at the same time press against the mandrels N, which together form the end bucklings into square-cornered flanges. The completion of this operation is illustrated in Fig. 12, the frame-plate X being shown still between the dies. The loose parts L L are arranged, as shown, to allow of contraction of the frame-plate during cooling and as it is being forced from the female die J by the action of sundry small rams of the machine or by other means. These parts L L, as clearly shown in Fig. 14, when they are

in the position there shown, are not in contact at their ends, as shown by the openings, being held outward by the wedge mechanism shown, for instance, in detail in Fig. 16. Now
 5 the plate having been compressed, as shown in the said drawings, Figs. 16 and 12, the bolts and cotters being released which maintain the parts L and the exterior pressing parts in their relation with the press, as shown in
 10 Figs. 5 and 7, by gradually withdrawing the lower plate, B, it follows that these angular pieces will follow down with the metal and permit of the shrinkage of the metal. It is important that this withdrawal of the press
 15 B shall be gradual, allowing for the shrinkage of the metal, for if it were suddenly and rapidly done there would be a tendency for the metal to warp and shrink out of shape.

As will be observed, the withdrawal of
 20 pressure above referred to is in part a lateral withdrawal upon the flange.

I do not in this application claim, broadly, the idea of withdrawing pressure upon metal.

I do not in this application claim the apparatus herein described, having made application therefor on the 18th day of January,
 25 1888, Serial No. 261,166, of which this application is a division.

What I claim as my invention, and desire
 30 to secure by Letters Patent, is—

1. The process of forming a flanged metal plate in which the flanges are practically at right angles to the plate without permitting the said plate to warp or bind upon the pressing-dies, which consists in pressing the same
 35 between a properly-shaped male and female die and in gradually withdrawing the lateral pressure of the male die upon the flange during the process of cooling, and simultaneously with said cooling, substantially as described. 40

2. The process of forming a flanged metal plate in which the flanges are practically at right angles to the plate without permitting the said plate to warp or bind upon the pressing-dies, which consists in pressing the same
 45 between a properly-shaped male and female die and in gradually withdrawing the vertical and lateral pressure of the male die upon the flange during the process of cooling, and simultaneously with said cooling, substan- 50 tially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMSON FOX.

Witnesses:

WILLIAM VÉVERS,

GEO. F. MOSS,

*Clerks to Messrs. T. & H. Greenwood Teale,
 Solicitors, Leeds.*