

E. DOR-DELATTE.
HYDRAULIC PRESS.

APPLICATION FILED MAY 2, 1904.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.

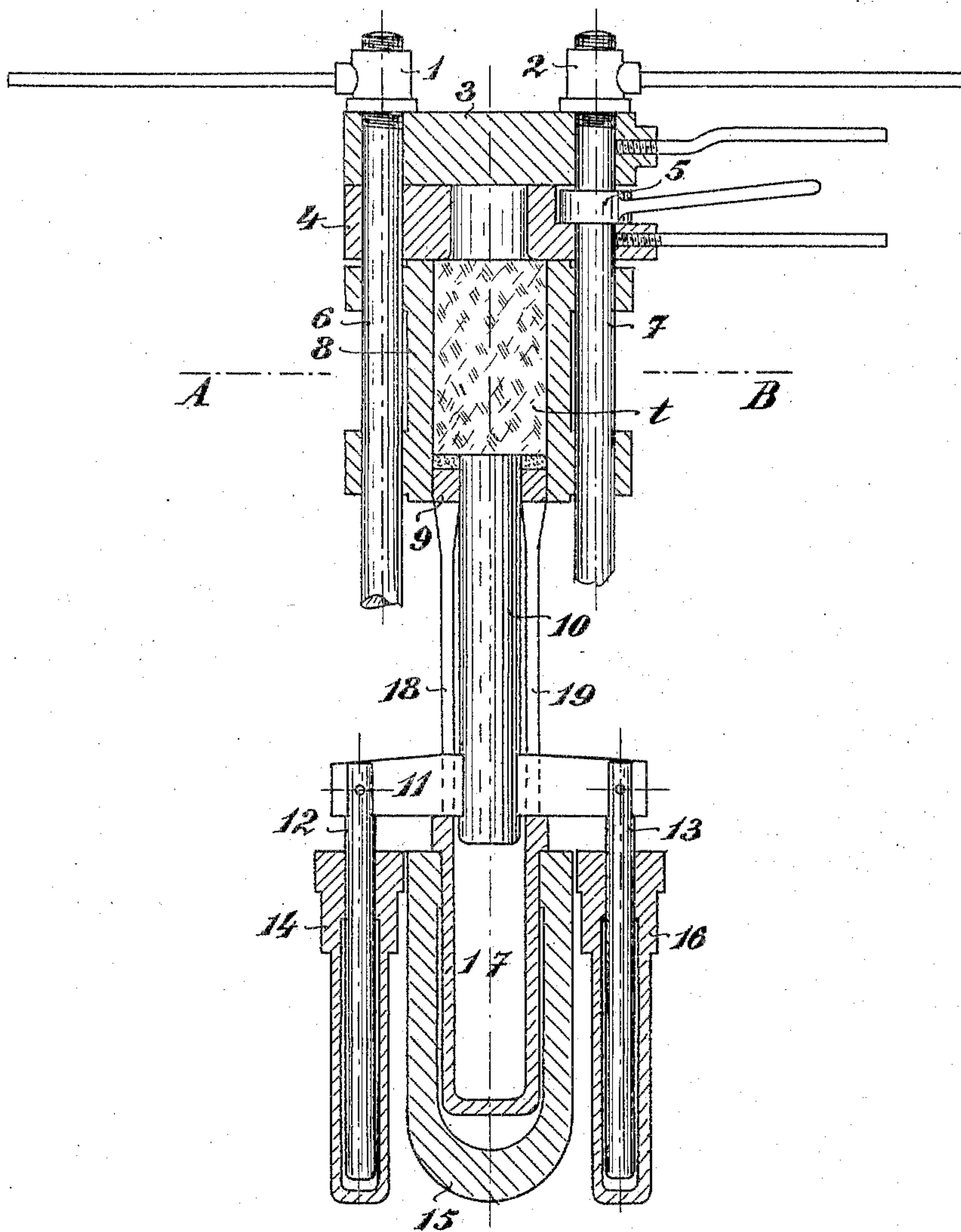
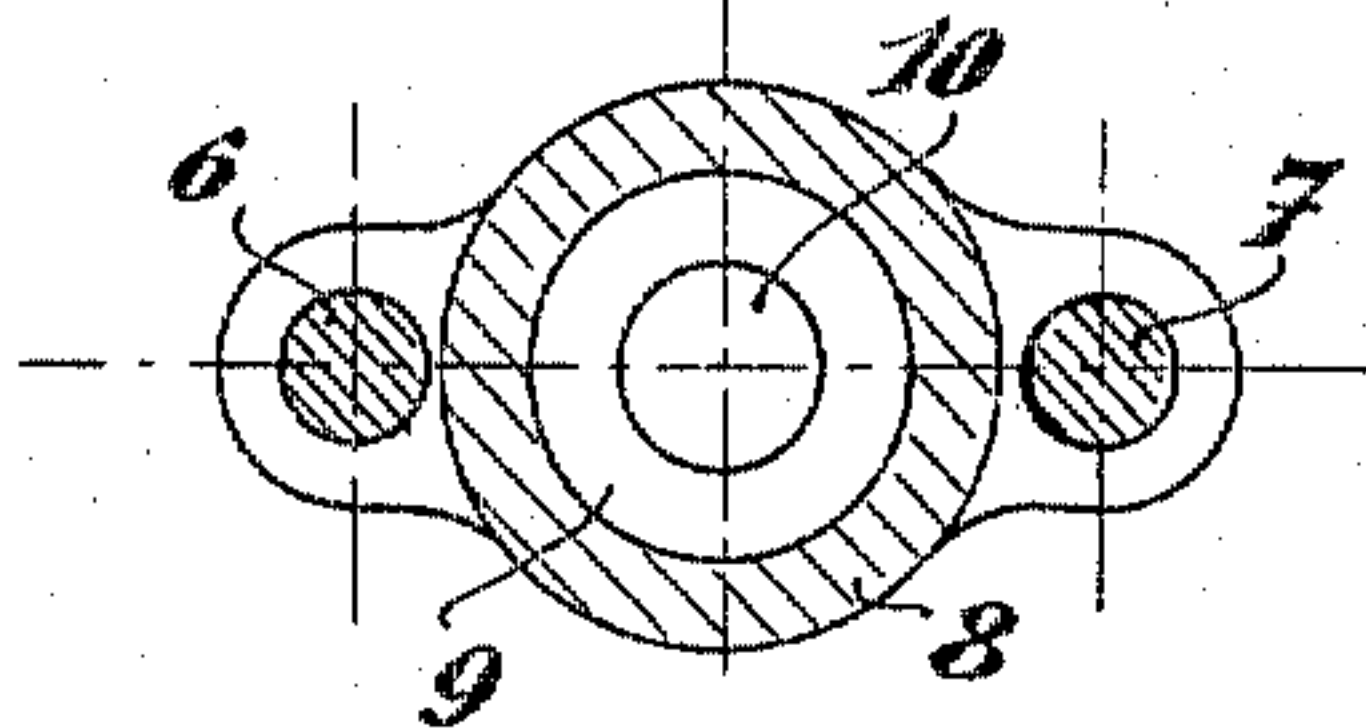


Fig. 4.



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4 SHEETS—SHEET 2.

Fig. 2.

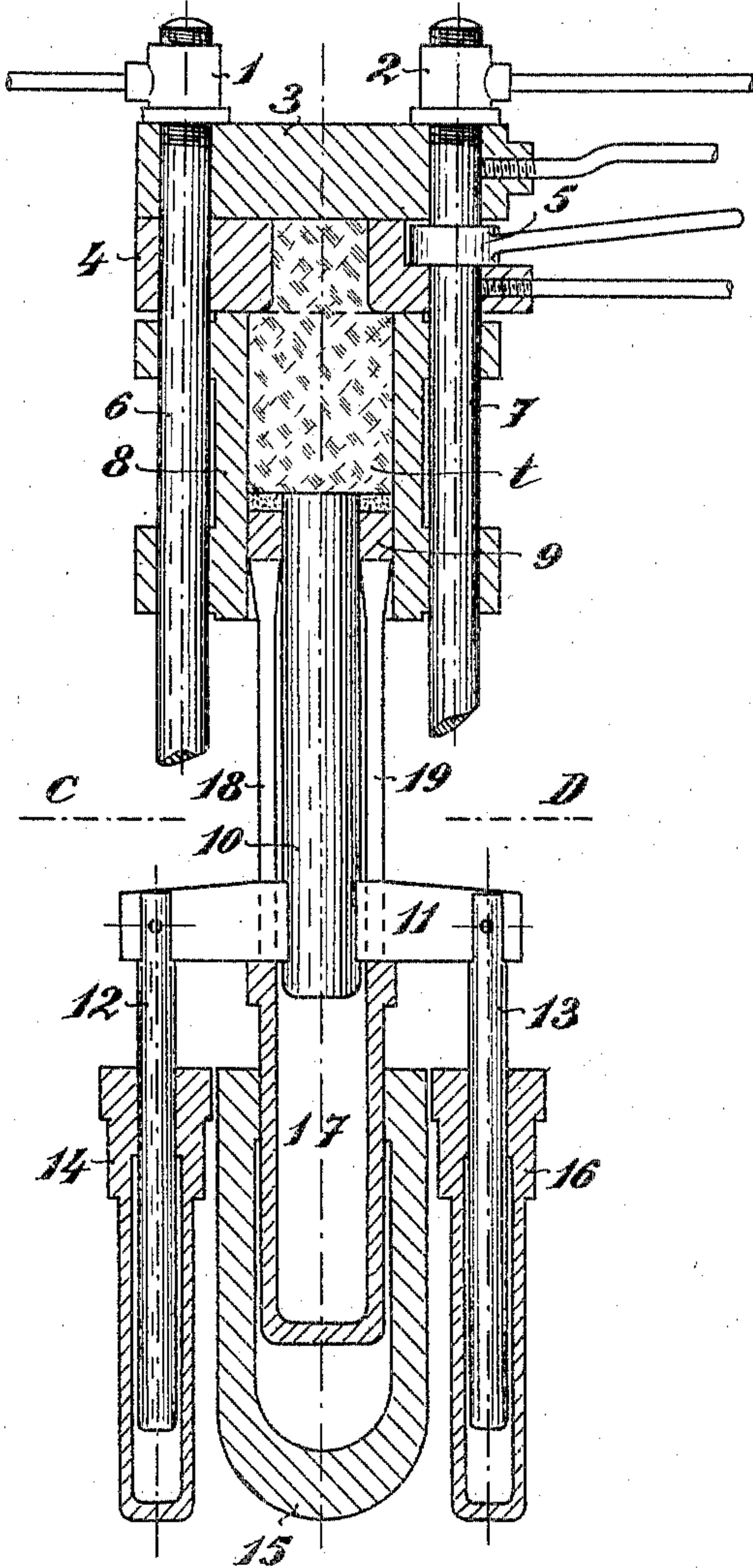


Fig. 3.

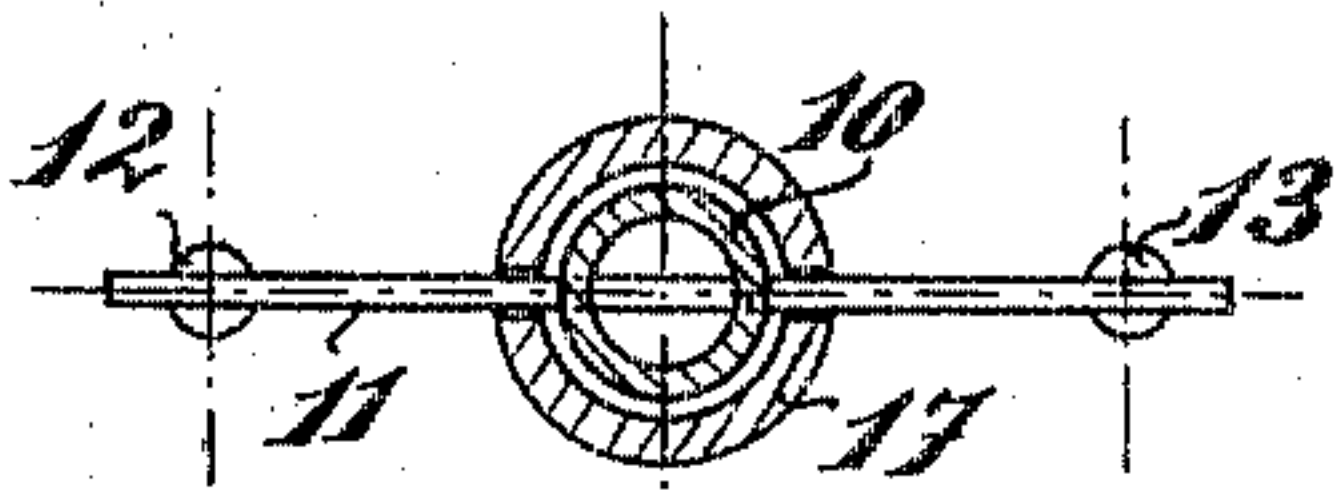
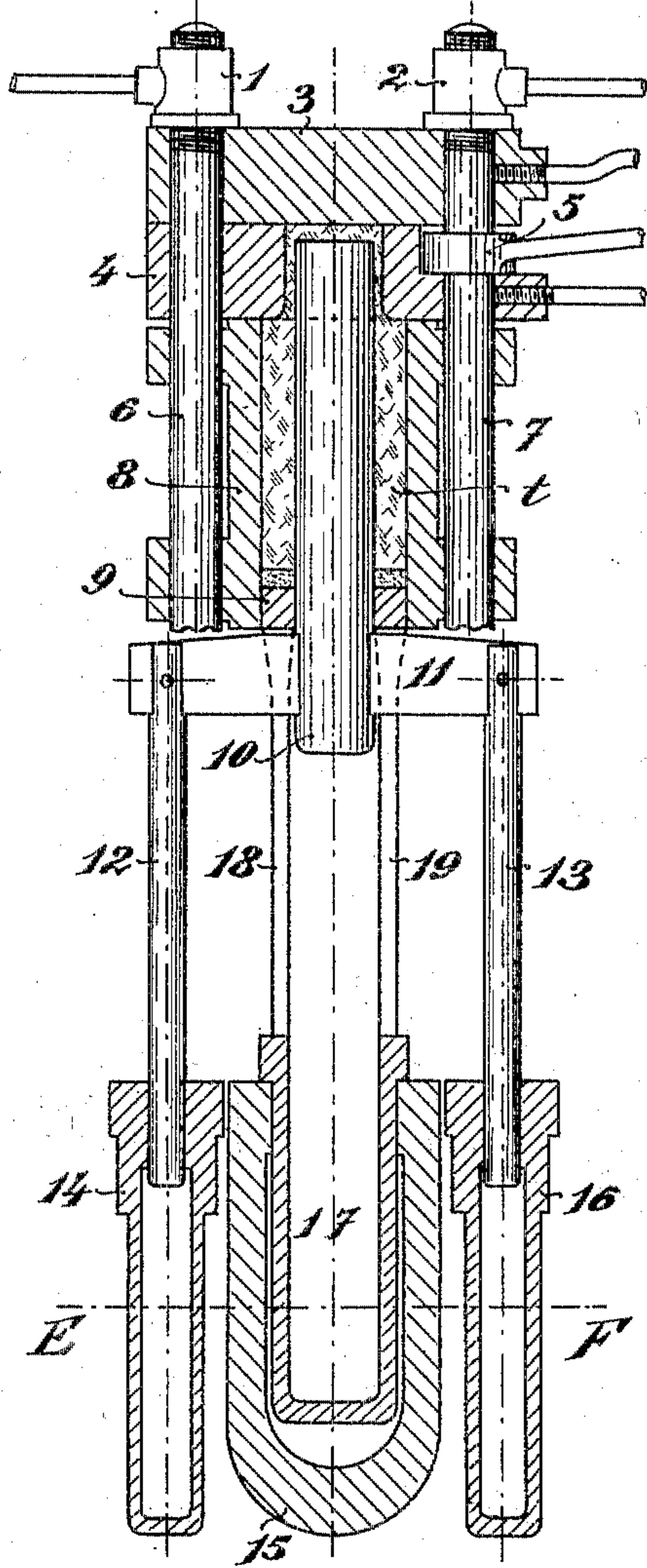


Fig. 5.

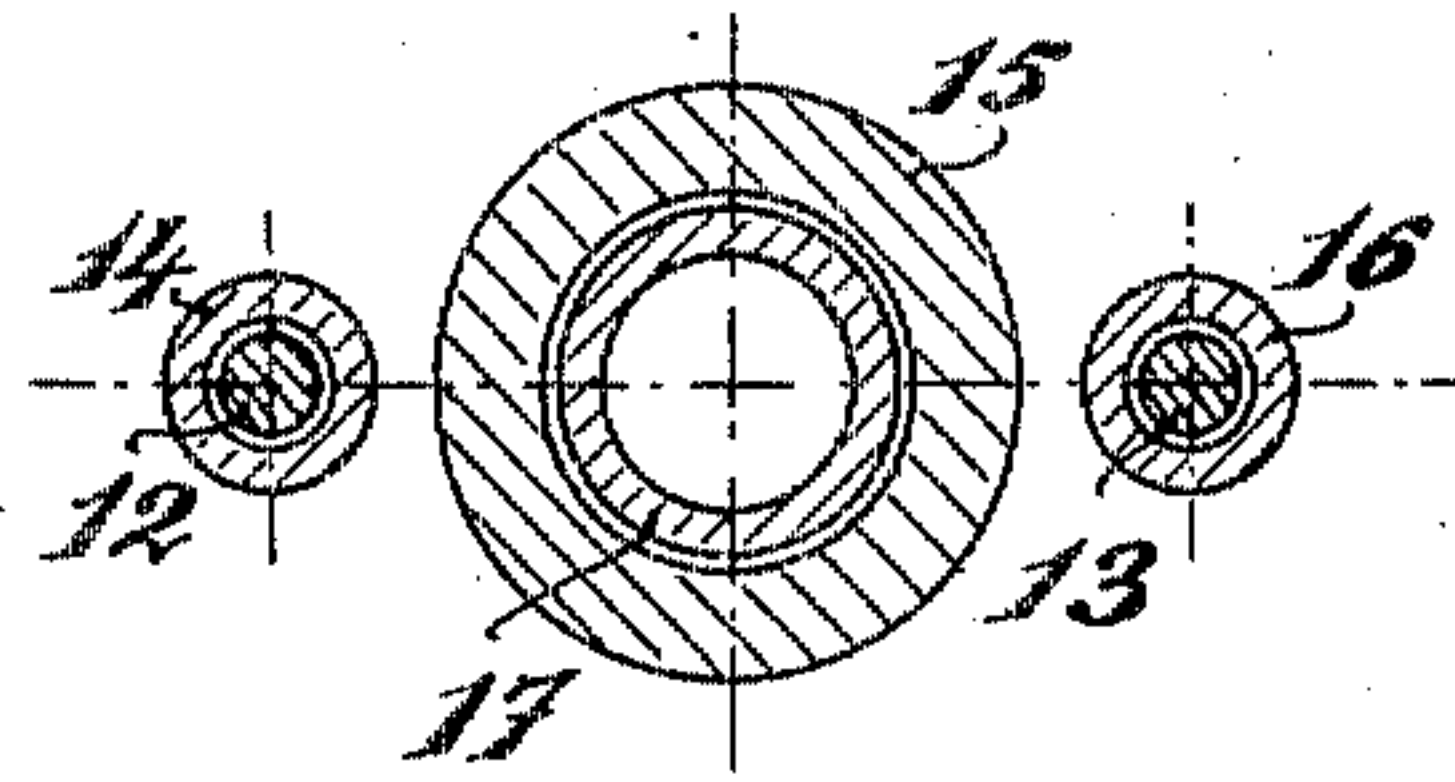


Fig. 6.

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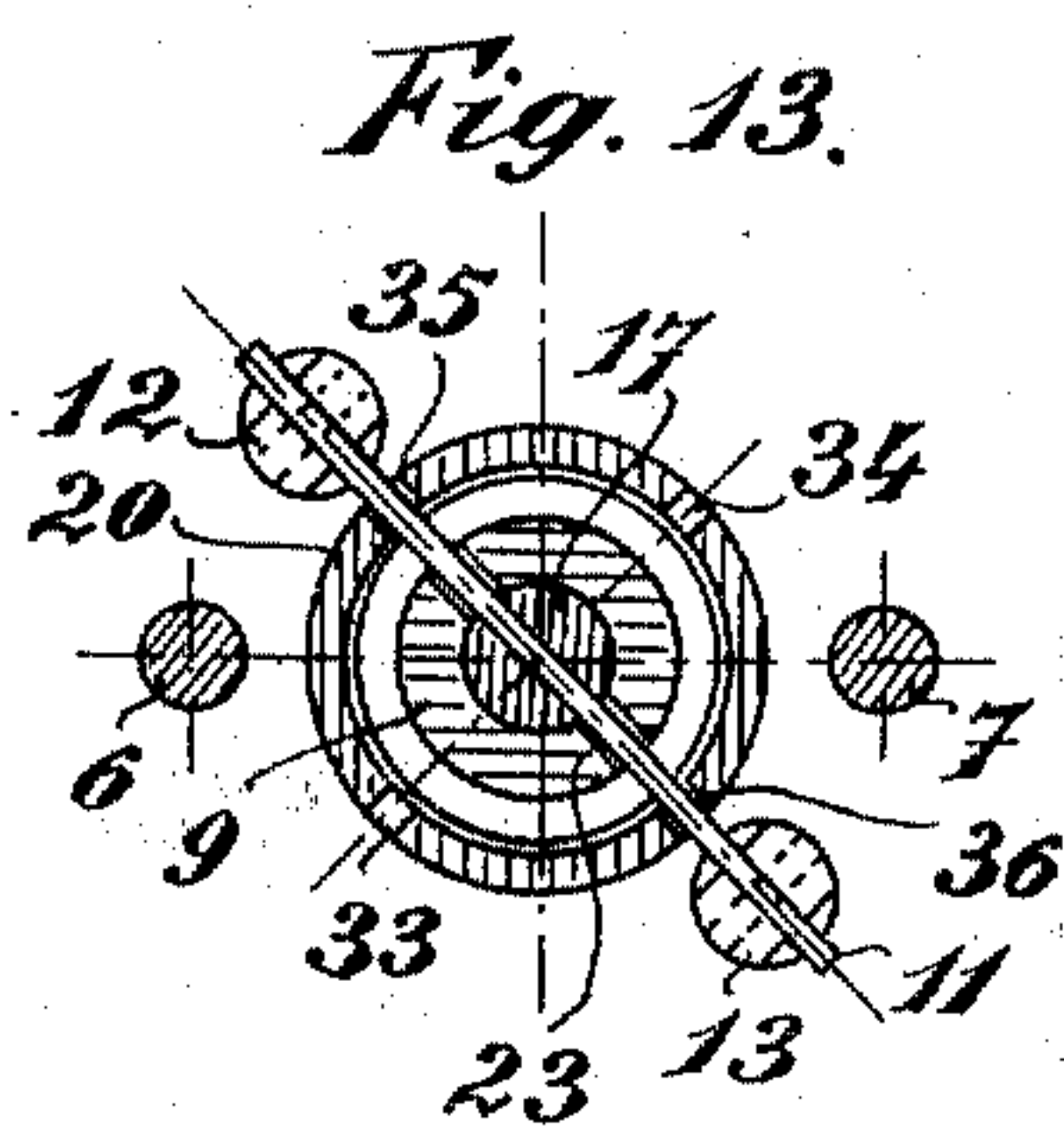
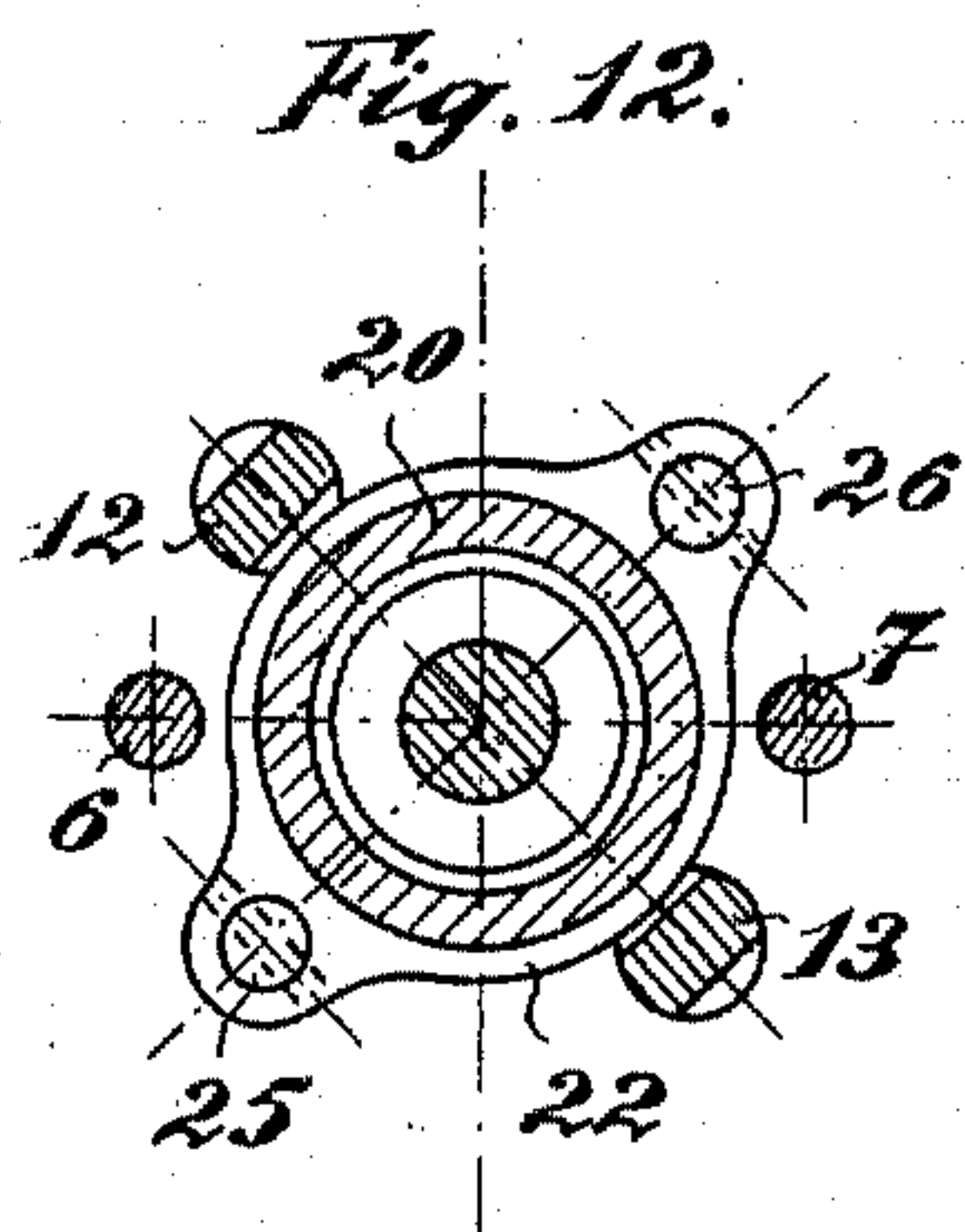
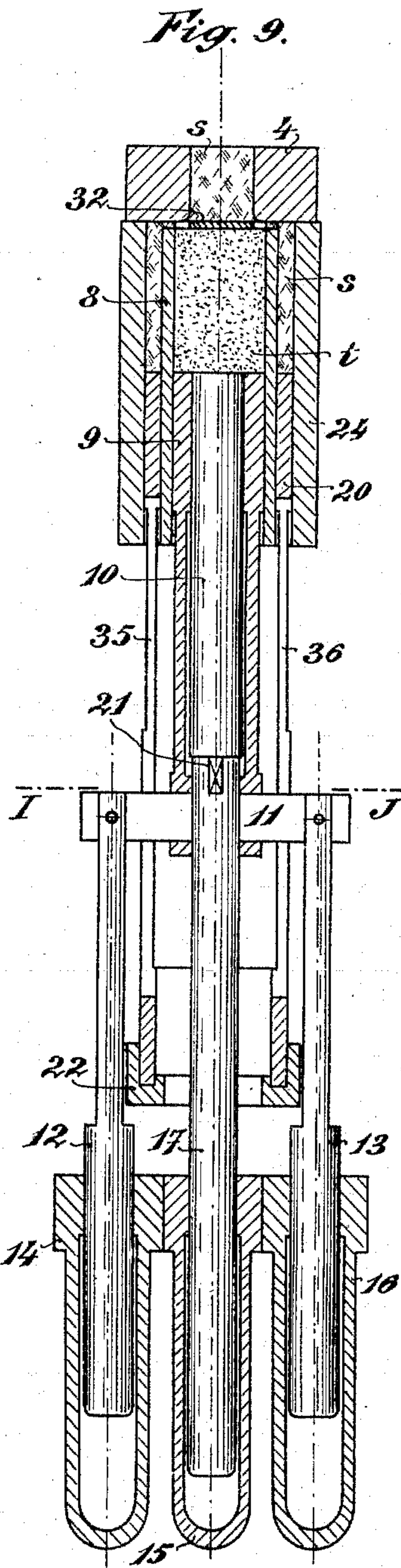
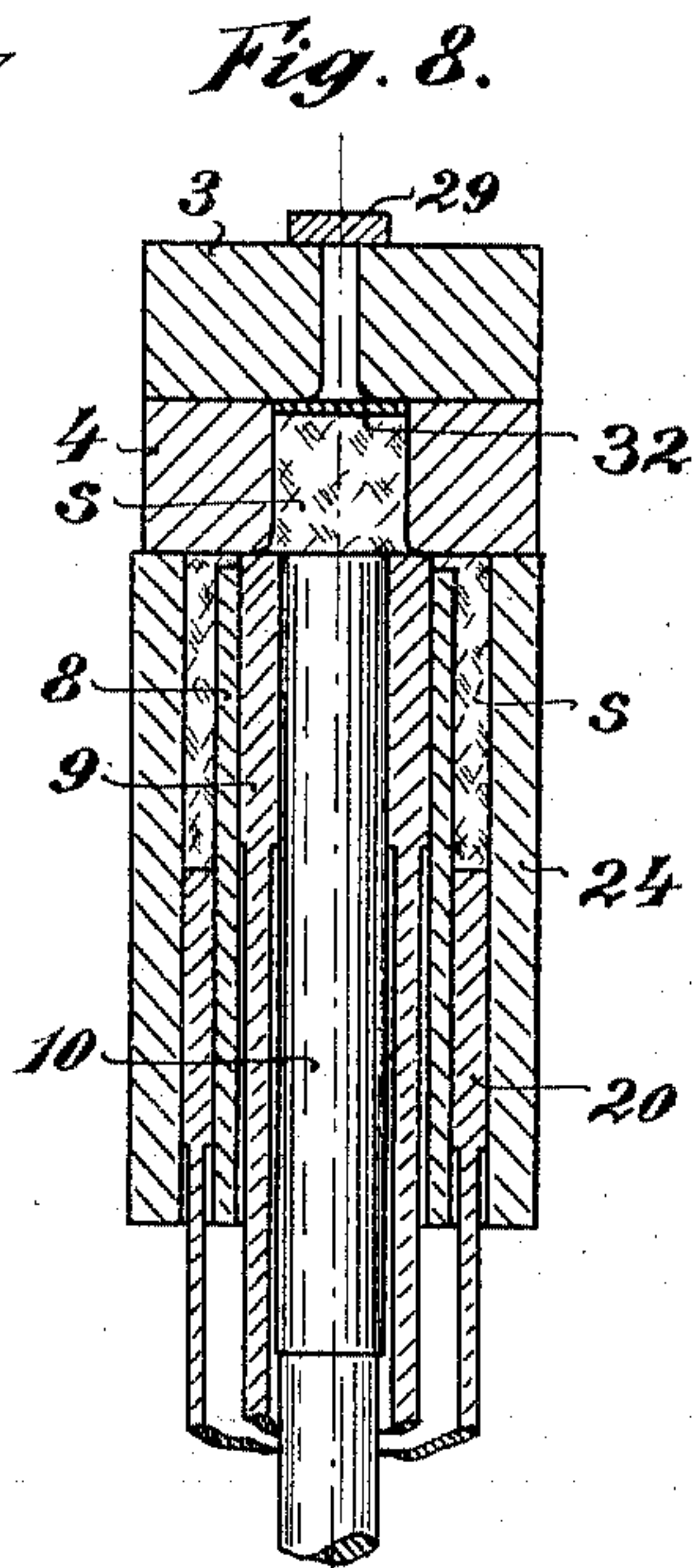
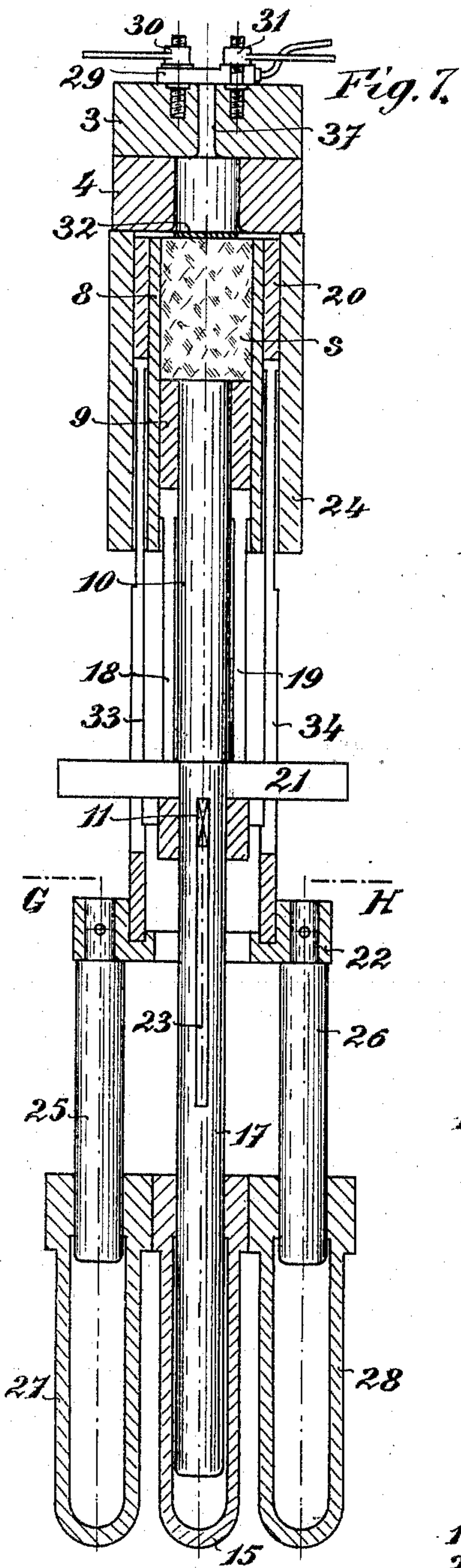
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4 SHEETS—SHEET 3.



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Fig. 10.

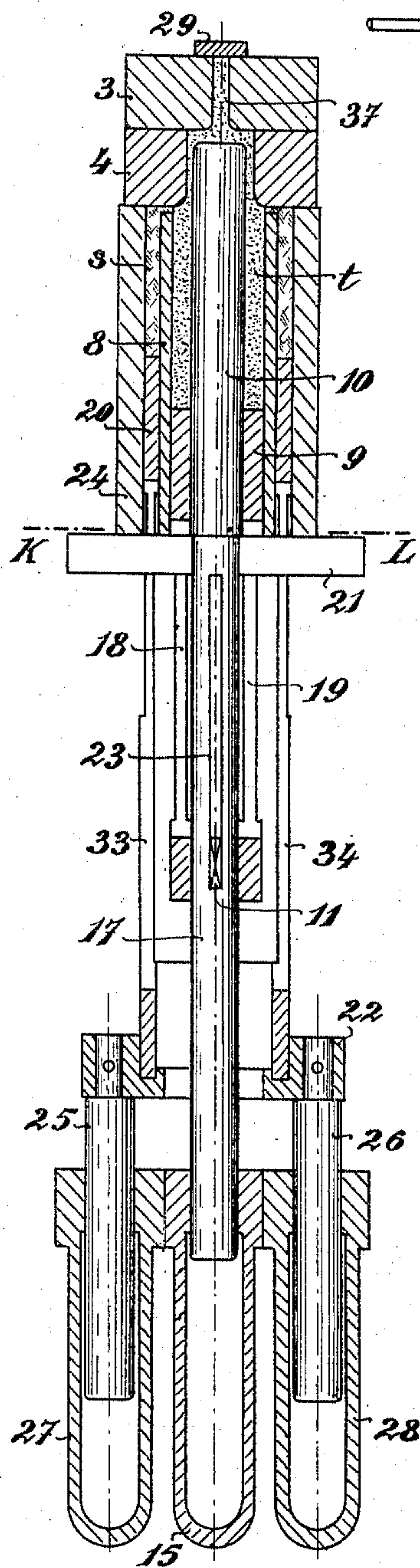
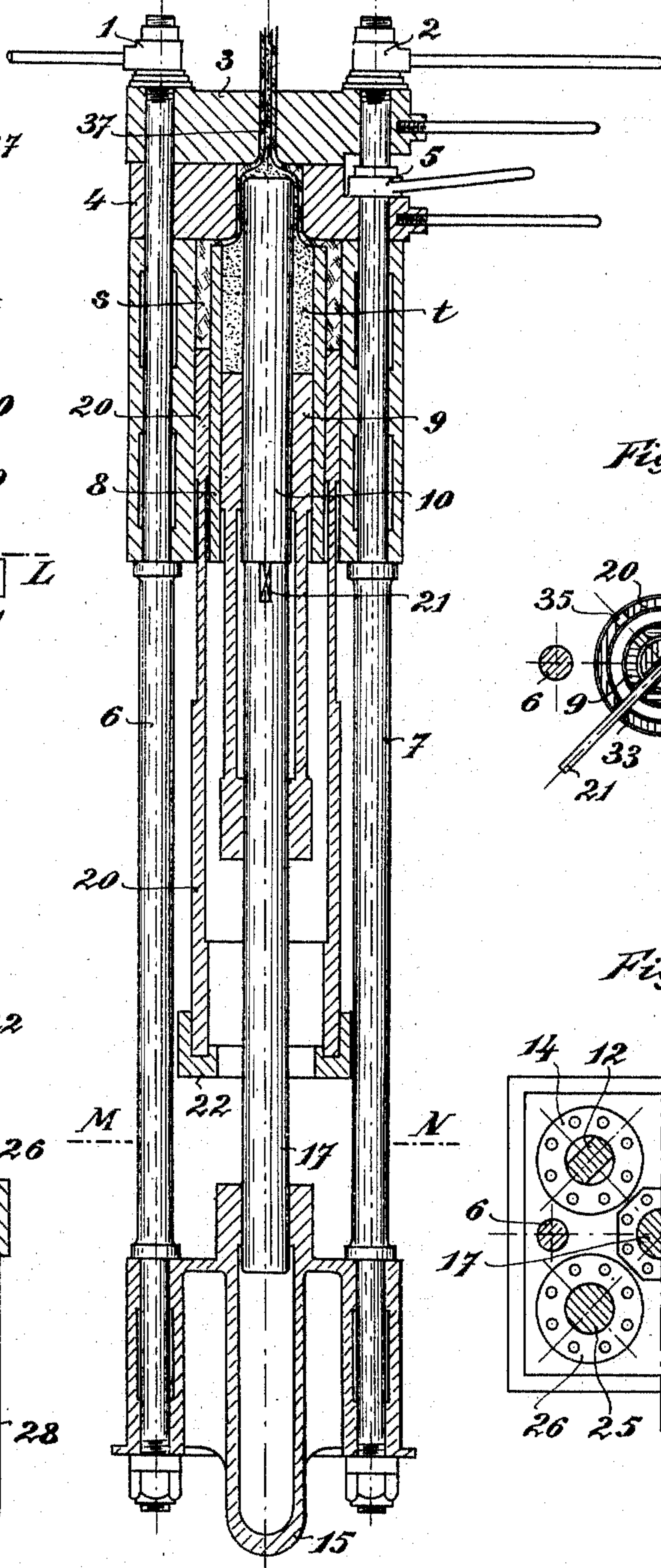


Fig. 11.



4 SHEETS—SHEET 4.

Fig. 14.

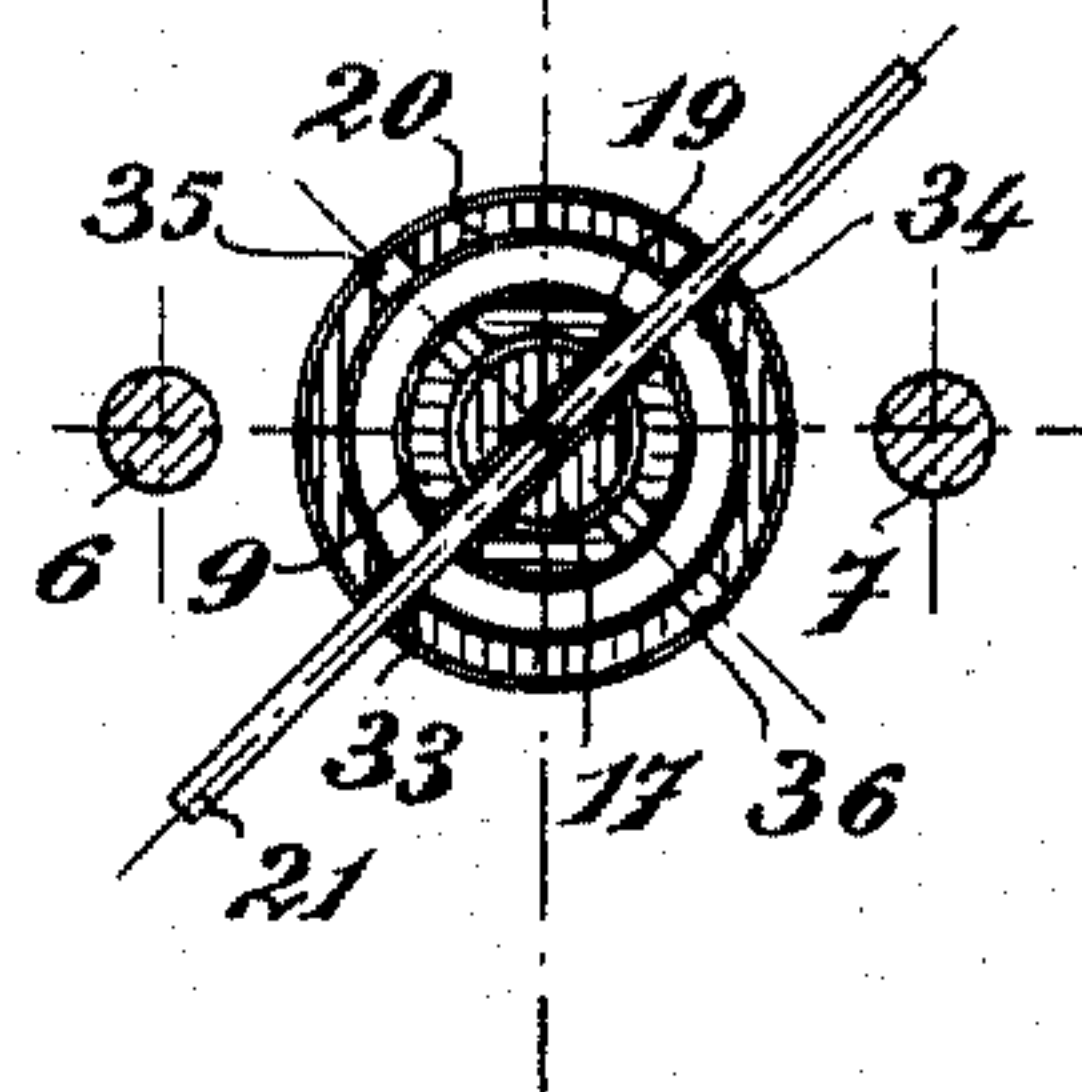
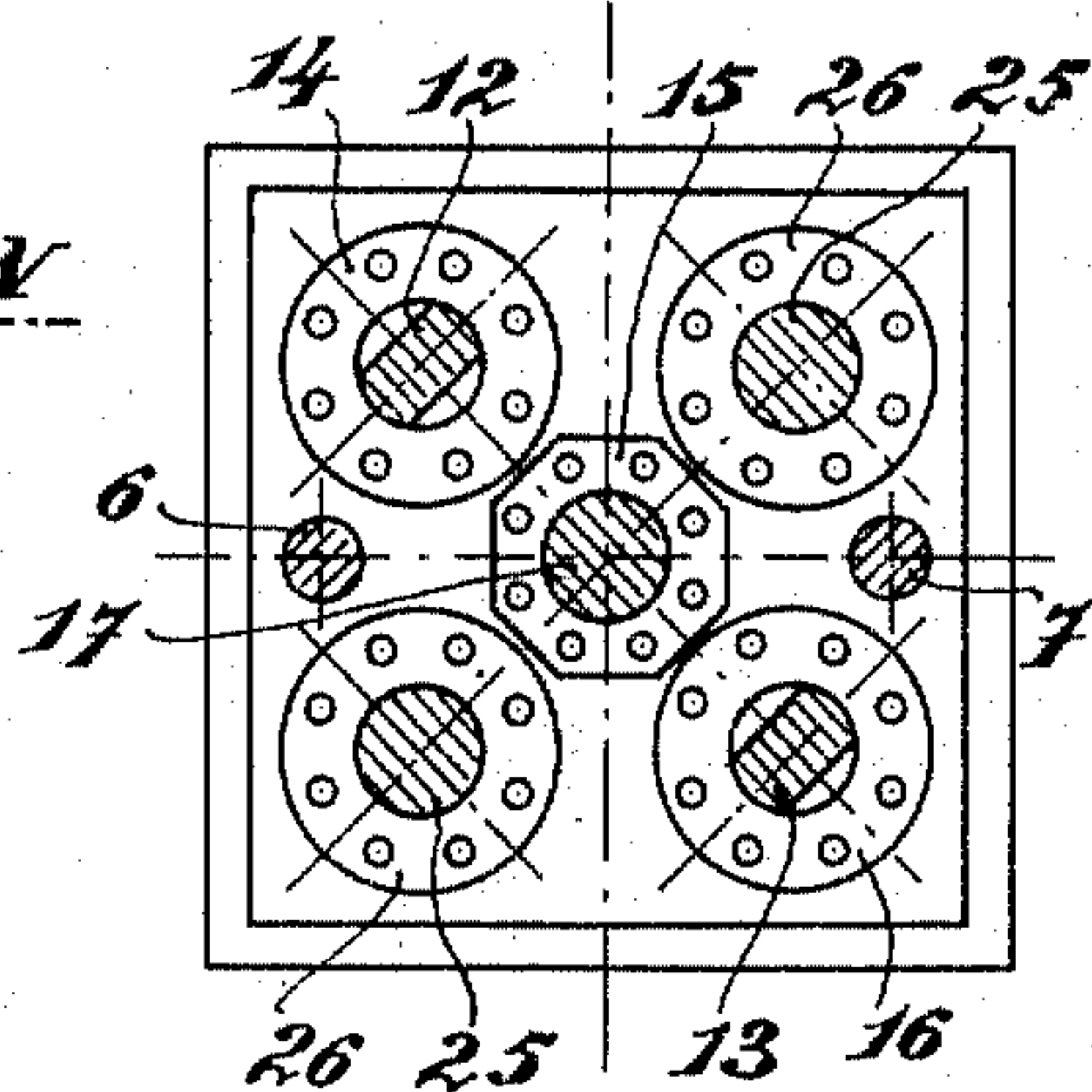


Fig. 15.



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UNITED STATES PATENT OFFICE.

EMILE DOR-DELATTRE, OF BUDEL, NETHERLANDS.

HYDRAULIC PRESS.

SPECIFICATION forming part of Letters Patent No. 777,249, dated December 13, 1904.

Application filed May 2, 1904. Serial No. 206,012. (No model.)

To all whom it may concern:

Be it known that I, EMILE DOR-DELATTRE, a subject of the King of Belgium, residing at Budel, Netherlands, have invented certain new and
5 useful Improvements in Hydraulic Presses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the
10 same.

This invention has reference to hydraulic presses to be used for producing crucibles, retorts for zinc-furnaces, retorts for the distillation of coal and other substances, earthen-
15 ware pipes, and the like, and which differ essentially from similar known presses from the fact that there is a complete absence of useless or detrimental spaces within the cylinder in which the compressing and forming operations
20 are conducted, and it is therefore impossible for air to get included in the earth, and consequently in the finished product, and, further, all parts of the paste are more evenly worked by being subjected to a constant maximum
25 pressure.

The accompanying drawings represent two presses constructed in accordance with this invention, the first of them being adapted for the production of ordinary hollow articles
30 from one kind of paste only, while the second is adapted for the production of retorts and the like from two different superposed materials.

In certain cases it is advantageous and sometimes necessary to make zinc-furnace retorts and like articles from two materials, of which that composing the exterior covering is capable of resisting the action of fire, while the material constituting the lining of the retort
40 is capable of resisting the corrosive action set up by the gangues contained in the ores or other minerals or bodies with which the retorts are charged, as it has not been found possible to obtain a material which will effectually resist both agents. Further, in order to obtain
45 retorts of a good quality it is not sufficient that the two component materials should be simply in close juxtaposition, but they must be actually connected by the penetration, as
50 it were, of the one material into the other.

In the said drawings, Figures 1, 2, and 3 represent vertical sections of the first-mentioned type of press, showing the compressor-piston in three different positions, corresponding to the three different stages of the operation. 55
Figs. 4, 5, and 6 are horizontal sections taken, respectively, on the lines A B, C D, and E F. Figs. 7, 8, and 10 show vertical sectional views of a press of the second-mentioned construction. Fig. 9 is another vertical section of the 60
double press, but taken at an angle of ninety degrees from the last-mentioned sections. Fig. 11 is a vertical section showing the two pillars which connect the earth-cylinders to the hydraulic cylinders, while Figs. 12, 13, 14, and 65
15 are horizontal sections of the double press, taken, respectively, on the dotted lines G H, I J, K L, and M N.

In the simpler form of press represented in Figs. 1 to 6, 1 and 2 are bronze nuts, which 70
are screwed on the ends of columns or pillars 6 and 7 and serve to rigidly secure both the cover 3 and the plate 4 (which has a central hole through it) to the end of the cylinder 8. Both the cover and the plate are capable of 75
swinging around the pillar 6 and of being secured to the other pillar, 7. The pillars 6 and 7, which carry the said cover 3, plate 4, and cylinder 8, also serve to connect these parts
80 to three hydraulic presses 14, 15, and 16, it being understood, however, that these presses are actually disposed in planes at right angles to those in which they are represented.

9 is an annular compressor-piston which works within the cylinder 8 and is made solid 85
with the ram 17 of the hydraulic press.

10 is a central compressor-piston which is connected to the rams 12 and 13 of the outer presses 14 16 by the cross-head 11 and is capable of independent movement within the 90
hollow piston 9. This central piston presents in horizontal section a form corresponding to the inside shape of the article to be produced, (the piston shown in the drawings being adapted for the production of cylindrical bodies,) 95
while the hollow piston 9 is internally of a form corresponding to the outside of the piston 10 and is externally cylindrical and of a diameter equal to that of the inside of the cylinder 8. The sides of the hollow piston 100

have longitudinal slots 18 and 19 to admit of the movement of the cross-head 11 of the inner piston.

Water under pressure is supplied from any suitable source to the hydraulic presses 14 and 16 and also to the press 15 by two suitable independent valves, so as to insure or provide for the collective movement of the two presses 14 and 16 in unison, but quite independent of the press 15.

The superficial areas of the hydraulic pistons 14, 16, and 17 and also those of the corresponding compressor-pistons 10 and 9 are such that given an equal hydraulic pressure on the pistons 14, 16, and 17 the disposable pressure or force exerted by the head of the compressor-piston 10 is less than that which is exerted under equal conditions by the head of the larger compressor-piston 9. In order to equalize the pressure exerted by the two compressor-pistons 9 and 10, the last named is also acted upon through the medium of the cross-head 11 by a part of the energy developed by the hydraulic piston 17, and it thus results that given an equal hydraulic pressure on the pistons 14, 16, and 17 the compressor-piston 10 is constrained to rise at the same rate as the hydraulic piston 17, and as a consequence the upper faces of the two pistons are always in the same horizontal plane.

Assuming that both the compressor-pistons 9 and 10 and also the hydraulic pistons 12, 13, and 17 are at the bottom ends of their respective strokes, as shown in Fig. 1, then by unscrewing the nuts 1, 2, and 5 and removing the cover 3 and the plate 4 the inside of the cylinder 8 is opened to admit of the introduction thereunto of a cylindrical lump of paste t of nearly the same diameter as the inside of the said cylinder and of a height equal to the distance between the upper faces of the compressor-pistons 9 and 10 and the top edges of the cylinder 8, which is thus completely filled with paste to the total exclusion of air therefrom.

The plate 4, which has a central aperture, is then fixed in place by the nuts 1 and 5 and the hydraulic pistons 12, 13, and 17 are subjected to an equal pressure and are thereby made to simultaneously raise the compressor-pistons 9 and 10, which drive before them the earthen paste within the cylinder and cause the same to completely fill up the central aperture in the plate 4, except slightly in the upper portion which lies within the said aperture of the plate. The movement of the compressor-pistons is arrested as soon as the displaced paste has completely filled up the hole in the plate 4. Then by means of a special tool the top of the paste is smoothed off perfectly flush with the top side of the plate 4 and is thus perfectly freed from holes or fissures, after which the cover 3 is placed in position (see Fig. 2) and secured by the nuts 1

and 2. Having thus affixed the cover, the hydraulic presses 14, 16, and 15 are again brought into operation until the press 15 is exerting the maximum pressure of which it is capable. During this part of the operation the heads of the compressor-pistons remain both at the same level and the paste is subjected to maximum compression which the presses can develop under these conditions without being in any way deformed or distorted. At this moment the press 15 is brought into connection with a hydraulic accumulator, which is regulated to act for maintaining in the press 15 the maximum pressure which it is capable of supporting. The pressure in the presses 14 and 16 is then augmented to such an extent as to drive the piston 10 centrally into the compressed paste t and forms a hole in the said paste without leaving any fissures or crevices therein, and the paste which is thus displaced by the action of the compressor 10 reacts upon the annular piston 9 and upon the hydraulic piston 17 connected therewith and forces the same downward, so that the said piston 17 expels the water from the press 15 into the accumulator, with which it is connected and which during the whole of this operation has been maintaining a maximum pressure. This stage of the process is completed when the cross-head 11 reaches the bottom of the cylinder 8, when the various pistons are in the several relative positions indicated in Fig. 3. During the whole of the movement of the piston 10 the paste has been subjected to the maximum pressure developed by the press, and this feature, with the preliminary compression to which the paste is submitted before perforation, constitutes one of the most important advantages attained by the new process.

After the above-described operations have been completed the cover is removed, and then while the piston 10 is maintained at the top of its stroke the annular piston 9 is made to rise and expel the fashioned article from the cylinder.

As will be ascertained by an inspection of the drawings, the modified arrangement of press represented in Figs. 7 to 14 comprises two concentric paste-cylinders 24 and 8 (the cylinder 8 is fixed to the cylinder 24 by four steel bars, not shown in the drawings, passing through slots 33 34 35 36 in the hollow piston 20) and two hollow pistons 20 and 9, the former being operated by the two hydraulic pistons 25 and 26 and the cross-head 22, which connects them, while the latter is worked by the two hydraulic pistons 12 and 13 and the cross-head 11. The arrangement also comprises a central piston 10, operated by the hydraulic piston 17, which is slotted at 23 to provide a passage for the cross-head 11. A further cross-piece 21, fixed to the hydraulic piston 17, is arranged to limit its upward stroke and extends through the slots

33 34 and 18 19 of the two hollow pistons, while the cross-piece 11 extends through the slots 35 36 of the piston 20 and through a slot 23 in the hydraulic piston 17. The three series of pistons are absolutely independent of one another and each is capable of making a full stroke without affecting the position of its neighbor. The relative superficial areas of the compressor-pistons 9 and 10 and the corresponding hydraulic pistons 12, 13, and 17 are the same as those of the similar parts in the press for working a single paste, and they operate in exactly the same manner when working upon the charge of paste *t* in the cylinder 8; but this arrangement differs from that already described by the provision of a second paste-cylinder 24, concentric with the cylinder 8, by the disposition of the hollow compressor-piston located between the two cylinders, and the arrangement of the additional hydraulic cylinders 27 and 28 for operating the said hollow piston 20. A further difference is that an opening 37 is formed in the cover 3 and is closed by the small lid 29 and the additional nuts 30 and 31. Suitable provision is made for connecting the five hydraulic pistons either collectively or separately to a hydraulic accumulator, it being understood, however, that the pistons 12 and 13 move together, the same as the pistons 25 and 26, and, further, the pistons 12 and 13 and also 17 are provided with means whereby they may be connected, either independently or collectively, with a group of hydraulic pumps capable of developing a pressure in excess of that obtainable from the accumulator.

It may be here remarked that the longer cylinder 8 terminates at its upper end a short distance below the under side of the plate 4, so as to leave a circular space into which the paste is forced in order to form a cover for the end of the retort.

The operation of the press is as follows: When the central piston 10 and the hollow pistons 9 and 20 are in the respective positions indicated in Fig. 7, the cover 3 and the plate 4 are removed and a charge of paste *s* is introduced and a disk of iron 32 is placed thereon, the only object of this disk being to facilitate the subsequent closing of the cover 3, and it may, if desired, be dispensed with. The plate 4 and cover 3 are replaced, and the accumulator is connected up with the pistons 12, 13, and 17 of the press, which are operated while the hollow cylinder 20 is held in place by the pistons 25 and 26. In these conditions, as in the case of the press for the single paste, the central piston 10 and the hollow piston 9 rise together and ram a part of the charge of paste *s* into the central space in the plate 4. The attendant then manipulates the distribution-valves of the system and brings the presses 27 and 28 into communication with the accumulator, while the presses 14, 16, and 15 are connected up directly with the pumps, with

the result that the pistons 10 and 9 continue to rise together under the effect of the enhanced pressure and compel the paste *s* to completely fill up the whole of the spaces within the press to drive down the hollow piston 20, located in the annular space left between the two cylinders 24 and 8 and into which the paste is forced, and during this downward movement the said hollow piston 20 forces down the two hydraulic pistons 25 and 26 and the latter displaces the water from the presses 27 and 28 into the accumulator, with the result that during this stage of the operation the paste is worked upon while under a counter pressure or resistance equal to the maximum effort which is capable of being exerted upon the annular piston 20. This stage of the process is completed as soon as the two pistons 9 and 10 arrive at the positions indicated in Fig. 8. At this moment the piston 20 is held fast and the pumps 27 and 28 cut off, and the pistons 9 and 10 are allowed to descend into the positions in which they are represented in Fig. 9. The cover 3 and the plate 4 (which contains a portion of the paste *s* within its aperture) are removed and a charge of another kind of paste *t* is introduced into the press, and the iron disk 32 is placed upon the top of the new charge, its object in this case being to separate the paste *t* from the portion of the paste *s* contained within the hole in the plate 4. This plate is replaced in the position shown in Fig. 9, and after it has been fixed the accumulator-pressure is exerted upon the pistons of the presses 14, 16, and 15, while the hollow piston 20 is held stationary. Under the effect of the said pressure the hydraulic pistons 12, 13, and 17 are raised bodily with the two pistons 9 and 10, which thrust a portion of the paste *t* into the hole in the plate 4 and expels therefrom the superfluous portion of the paste *s*, which is removed by the attendant, together with the iron disk 32. The communication between the accumulator and the presses 14, 16, and 15 is closed while the cover 3 is replaced, after which the connection between the presses 14 and 16 and the accumulator is restored while the press 15 is connected directly with the pump. As in the case of the press for working a single paste the charge *t* is at first strongly compressed against the cover 3, after which the central piston 10 is subjected to greatest pressure capable of being exerted by the pumps and is driven through the paste *t*, and the displaced material reacts against the annular piston, which is forced downward and overcomes the resistance afforded by the accumulator, so that the paste is thus worked upon while being subjected to the maximum pressure of the press. During the whole of this operation the piston 20 is held stationary, and when the said operation is complete the three pistons occupy the positions shown in Fig. 10, which also represents the forms im-

parted to the two pastes *t* and *s*. The presses 14 and 16 are again disconnected from the accumulator and the press 15 from the pumps. The small cover 29 is then opened and the
 5 presses 14 and 15 and also the presses 27 and 28 are again placed in communication with the accumulator, and thus the annular pistons 9 and 20 are raised together by the pressure exerted by the accumulator and force up or
 10 displace both the pastes, and a portion of the paste *t* first escapes alone through the hole 37 in the cover 3, after which part of the paste *s* is also expelled through the same hole. The two pastes and the pistons then take the
 15 forms and positions indicated in Fig. 11. The ascending motion of the hollow pistons 9 and 20 is now arrested, and the cover 3 is opened and leaves the fashioned retort free to be expelled upwardly from the press.

20 As can be ascertained by an inspection of Fig. 11, the paste *t* is completely surrounded or inclosed by the paste *s*, save at the center of the bottom of the retort, where a small part of the paste *t* protrudes; but before the
 25 retort is expelled from the apparatus this exposed part is removed by hand and replaced by a small piece of the paste *s*, which is rammed tightly in place by means of a wooden mallet. Then communication between the
 30 accumulator and the presses 14, 16, 25, and 26 is restored, and the two hollow pistons are allowed to continue their ascending movement for completely expelling from the press the retort formed by the two pastes *t* and *s*.

35 The relative thicknesses of the two pastes vary according to the relative speeds of the two hollow pistons, whose motions may at all forms be regulated or controlled by means of a special distributing-valve operated by
 40 the attendant.

In order that the paste *s* may form the envelop or covering of the retort, the same must strongly press around the paste *t*, and therefore the two pastes are subjected to a very
 45 strong pressure, applied and distributed in such a manner that the two materials are forced together and connected not merely by a simple contact, but by a veritable penetration of the one into the other, which forms,
 50 as it were, an intermediate transitional layer between the two pastes and by which they are securely united. This press, Figs. 7 to 15, may be adapted for working up single pastes only without any change beyond making pro-
 55 vision for the holding of the hollow piston 20 at the extreme top of its stroke during the whole of the operations.

Having fully described my invention, what I desire to claim and secure by Letters Pat-
 60 ent is—

1. In a press for the purpose described, the combination with a mold or casing adapted to receive the plastic material, of a plurality of concentrically-arranged plungers for operat-
 65 ing on the material within the mold, means

for simultaneously moving all of said plungers into the mold with equal force to compress the material, and means for maintaining said pressure on all but one of said plungers while imparting additional force to that plun- 70 ger, to properly shape the compressed material.

2. In a press for the purpose described, the combination with a mold or casing adapted to receive the plastic material, of a plurality of 75 concentrically-arranged plungers for operating on the material within the mold, means for simultaneously moving all of said plungers into the mold with equal force to compress the material, and means for maintain- 80 ing said pressure on all but the inner of said plungers while imparting additional pressure to said inner plunger to properly shape the compressed material.

3. In a press for the purpose described, the 85 combination with a mold or casing adapted to receive the plastic material, of a plurality of concentrically-arranged plungers for operating on the material within the mold, the inner one of said plungers being solid, means for 90 simultaneously moving all of said plungers into the mold with equal force to compress the material, and means for imparting additional force to the solid plunger, while maintaining the material under the pressure pre- 95 viously applied thereto, to properly shape the compressed material.

4. In a press for the purpose described, the combination with a mold or casing adapted to receive the plastic material, of a plurality of 100 concentrically-arranged plungers for operating on the material within the mold, the inner one of said plungers being solid, means for simultaneously moving all of said plungers with equal force to compress the material, 105 means for imparting additional force to the solid plunger, while maintaining the material under the pressure previously applied thereto, to force said solid plunger into the body of the compressed material, and means for 110 forcing the shaped material from said solid plunger.

5. In a press for the purpose described, the combination of a mold having a cavity therein which opens through the lower face of the 115 mold and provided at its upper end with an opening or reduced passage that communicates with said cavity, detachable means for closing said opening in the top of the mold, a plurality of concentrically-arranged plungers adapted 120 to be reciprocated in said cavity in the mold, means for simultaneously moving all of said plungers with equal force to compress the material, and means for maintaining said pressure on all but one of said plungers while im- 125 parting additional force to that plunger, to properly shape the compressed material.

6. In a press for the purpose described, the combination of a mold having a cavity therein which opens through the lower face of the 130

5 mold and provided at its upper end with an opening or reduced passage that communicates with said cavity, detachable means for closing said opening in the top of the mold, a series
10 of plungers arranged to be reciprocated in said cavity in the mold, said series comprising an inner solid plunger and a plurality of concentrically-arranged tubular plungers, means for simultaneously moving all of said plungers
15 with equal force to compress the material, and means for maintaining said pressure on all but one of said plungers while imparting additional force to that plunger, to properly shape the compressed material.

20 7. In a press for the purpose described, the combination of a mold having its interior divided into two concentric compartments, the wall separating said compartments being shorter than the depth of the compartments
25 whereby said compartments communicate with each other and with a passage formed in the adjacent wall of the mold, two concentrically-arranged plungers extending into the inner compartment in the mold, a tubular plunger, concentric with those aforesaid, extending into the outer compartment of the mold, and means for moving the pistons in

both compartments of the mold simultaneously or in either of said compartments independently, and means for moving either piston in the inner mold-compartment independently of the other piston in the same compartment.

8. In a press for the purpose described, the combination of a mold having its interior divided into two concentric compartments communicating at one end, means for compressing plastic material in both said compartments, means for forming a cavity in the material compressed in the inner compartment of the mold, and means for simultaneously forcing the compressed material from both said compartments through a reduced passage whereby the two bodies will be united and constitute opposite faces of the article formed by the press.

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

EMILE DOR-DELATTRE.

Witnesses:

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ALPH. LERUTH.